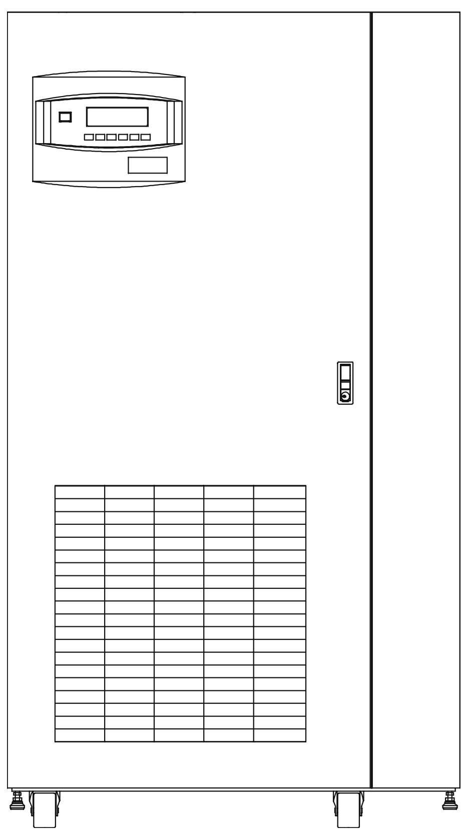
Liebert
Keeping Business In Business

POWER PROTECTION

Npower™ UPS

INSTALLATION MANUAL



30-130 kVA, 60 Hz
Single Module Systems
1+1 Redundant Systems

EMERSON
Network Power

The following WARNING applies to battery cabinets supplied with UPS sysems:

WARNING
HAZARD

INTERNAL BATTERY STRAPPING MUST BE VERIFIED BY MANUFACTURER PRIOR TO MOVING A BATTERY CABINET FROM ITS INITIAL INSTALLATION LOCATION.

Battery cabinets contain non-spillable batteries.

Keep units upright.

Do not stack.

Do not tilt.

Failure to heed this warning could result in smoke, fire or electric hazard. Call 1-800-LIEBERT prior to moving battery cabinets from their initial installation location.

BEFORE YOU CALL...

If you require assistance for any reason, call Liebert Global Services at 1-800-543-2378. For LGS to assist you expediently, please have the following information available:

Part Numbers: ________________________________

Serial Numbers: ________________________________

kVA Rating: ________________________________

Date Purchased: ________________________________

Date Installed: ________________________________

Location: ________________________________

Input Voltage: ________________________________

Bypass Voltage: ________________________________

Output Voltage: ________________________________

Battery Reserve Time: ________________________________

IMPORTANT SAFETY INSTRUCTIONS

Save These Instructions.

This manual contains important instructions that should be followed during installation of your Npower UPS and batteries.

WARNING

EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 2,200 POUNDS (1,000 KG) TO 3,800 POUNDS (1,725 KG). THE BATTERY CABINETS WEIGH BETWEEN 1,600 POUNDS (725 KG) AND 5,050 POUNDS (3,000 KG).

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING EACH CABINET. TEST LIFT AND BALANCE THE CABINETS BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES.

OPEN AREAS BETWEEN CASTERS AT THE BASE OF THE MODULES AND BATTERY CABINETS CAN BE USED FOR FORKLIFT USE. THESE SURFACES WILL SUPPORT THE UNIT ONLY IF THE FORKS ARE COMPLETELY BENEATH THE UNIT.

THE INNER BARRIER PANEL OF THE BATTERY CABINET IS A STRUCTURAL ELEMENT. DO NOT MOVE BATTERY CABINET IF THIS PANEL HAS BEEN REMOVED.

FOLLOW ALL BATTERY SAFETY PRECAUTIONS WHEN INSTALLING, CHARGING, OR SERVICING BATTERIES. IN ADDITION TO THE HAZARD OF ELECTRIC SHOCK, GAS PRODUCED BY BATTERIES CAN BE EXPLOSIVE AND SULFURIC ACID CAN CAUSE SEVERE BURNS.

IN CASE OF FIRE INVOLVING ELECTRICAL EQUIPMENT, ONLY CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE IN ELECTRICAL FIRE FIGHTING, SHOULD BE USED.

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE.

BE CONSTANTLY AWARE THAT THE UPS SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES.

CHECK FOR VOLTAGE WITH BOTH AC AND DC VOLTMETERS PRIOR TO MAKING CONTACT.

WARNING

LOCATE CENTER OF GRAVITY SYMBOLS AND DETERMINE UNIT WEIGHT BEFORE HANDLING CABINET.

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1.0 SAFETY PRECAUTIONS

Read this manual thoroughly, paying special attention to the sections that apply to you, before working with the UPS. **Retain this manual for use by installing personnel.**

Under typical operation and with all UPS doors closed, only normal safety precautions are necessary. The area around the UPS system should be kept free from puddles of water, excess moisture, or debris.

Special safety precautions are required for procedures involving handling, installation, and maintenance of the UPS system or the battery. Observe all safety precautions in this manual before handling or installing the UPS system. Observe all precautions in the **Operation and Maintenance Manual,** before as well as during performance of all maintenance procedures. Observe all battery safety precautions before working on or near the battery.

This equipment contains several circuits that are energized with high voltage. Only test equipment designated for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with an AC and DC voltmeter to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high potentials may exist at the capacitor banks and at the batteries.

ONLY qualified service personnel should perform maintenance on the UPS system. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).

Unless all power is removed from the equipment, one person should never work alone. A second person should be standing by to assist and summon help in case an accident should occur.

Four types of messages are used throughout the manual to stress important text. Carefully read the text below each Danger, Warning, Caution, and Note and use professional skills and prudent care when performing the actions described by that text.

A **Danger** signals immediate hazards resulting in severe personal injury or death. For example:

DANGER
A DANGER SIGNALS IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.

A **Warning** signals the presence of a possible serious, life-threatening condition. For example:

WARNING
LETHAL VOLTAGES MAY BE PRESENT WITHIN THIS UNIT EVEN WHEN IT IS APPARENTLY NOT OPERATING. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH. DO NOT WORK ON OR OPERATE THIS EQUIPMENT UNLESS YOU ARE FULLY QUALIFIED TO DO SO!! NEVER WORK ALONE.

A **Caution** indicates a condition that could seriously damage equipment and possibly injure personnel. For example:

CAUTION
Extreme care is necessary when removing shoring braces. Do not strike the cabinet with hammers or other tools.

A **Note** emphasizes important text. If the note is not followed, equipment could be damaged or may not operate properly. For example:

NOTE
If the UPS system has a blown fuse, the cause should be determined before you replace the fuse. Contact Liebert Global Services.

2.0 INSTALLATION CONSIDERATIONS

Install your Npower UPS in accordance with the submittal drawing package and the following procedures. The submittal package is supplied by the Liebert Sales Representative.

A Liebert authorized representative must perform the initial system check-out and start-up to ensure proper system operation. Equipment warranties will be voided unless system start-up is performed by a Liebert authorized representative. Contact your local Liebert sales representative or Liebert Global Services at **1-800-543-2378** to arrange for system start-up.

CAUTION
Read this manual thoroughly before attempting to wire or operate the unit. Improper installation is the most significant cause of UPS start-up problems.

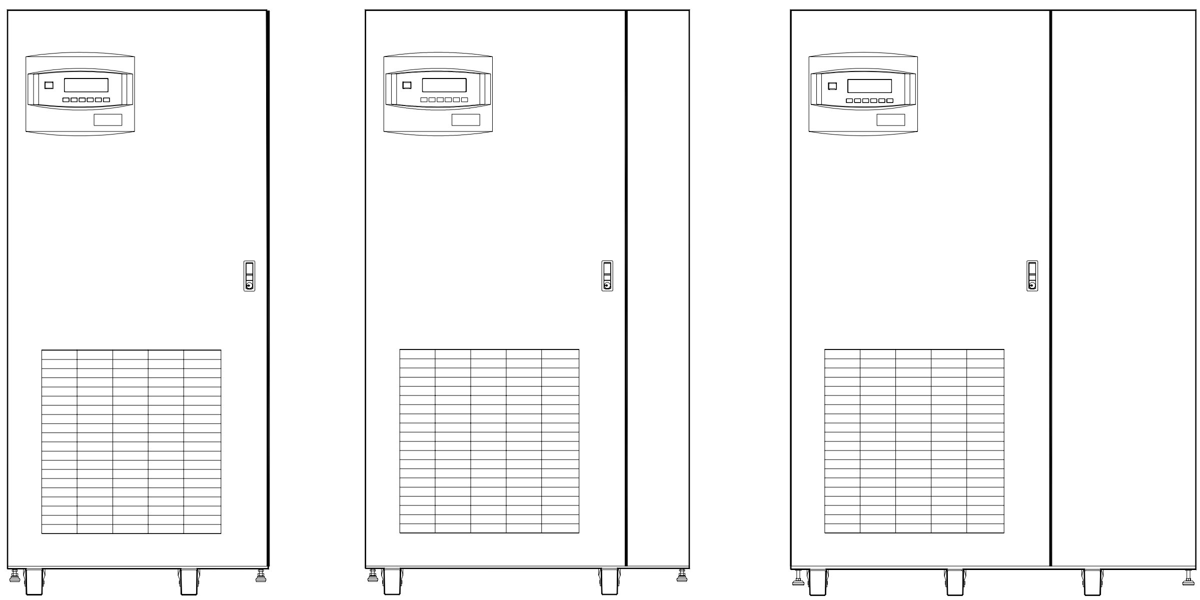
Do not install this equipment near gas or electric heaters. It is preferable to install the UPS in a restricted location to prevent access by unauthorized personnel.

1. Proper planning will speed unloading, location, and connection of the UPS. **Refer to Figure 11 through Figure 37 and Appendix A: Site Planning Data.**
2. Refer to information later in this manual regarding the optional Battery Cabinets. **Observe all battery safety precautions when working on or near the battery.**
3. Use the shortest output distribution cable runs possible, consistent with logical equipment arrangements and with allowances for future additions if planned.
4. Recommended ambient operating temperature is 25°C (77°F). Relative humidity must be less than 95%, non-condensing. Note that room ventilation is necessary, but air conditioning may not be required. Maximum ambient operating temperature is 40°C (104°F) without derating. At elevations above 6,500 feet (2,000 meters) derating may be required (consult your Liebert sales representative).
5. Ambient temperature of the batteries should not exceed 25°C (77°F). Higher ambient temperatures can cause significantly reduced battery life.
6. The standard Npower must be used with external overcurrent protection devices on the input, the output and (when applicable) the bypass. Please refer to **Appendix A: Site Planning Data** for required ratings of these devices.
7. During normal UPS operations, short-term current demand from the bypass AC input source may reach ten times the rated output current rating. The instantaneous trip settings of the upstream bypass AC input feeder breaker(s) must be set accordingly.
8. Even though your Liebert UPS unit is highly efficient, the heat output of any 3-phase UPS can be substantial. For more specific information, see **Appendix A: Site Planning Data.** Be sure environmental conditioning systems can accommodate this BTU load, even during utility outages.
9. The routing (inside the facility) to the installation site, as well as the floor at the final equipment location, must be capable of supporting the cabinet weight and the weight of any moving equipment. Refer to **Appendix A: Site Planning Data** for specific product weights.
10. Plan the routing to ensure that the unit can move through all aisleways, doorways, and around corners without risking damage. If the modules and batteries must be moved by elevator, check the size of the door openings and the weight-carrying capacity of the elevator.

CAUTION
The inner barrier panel at the front of the Battery Cabinet is a structural member. If the barrier panel has been removed for inspection or service, do not move the Battery Cabinet until the barrier panel has been replaced.

WARNING
LOCATE CENTER OF GRAVITY SYMBOLS AND DETERMINE UNIT WEIGHT BEFORE HANDLING CABINETS.

Figure 1 Npower UPS modules, left-to-right: 30-50 kVA, 65-80 kVA and 100-130 kVA



3.0 Unloading and Handling

The UPS module is shipped in one cabinet to allow easy handling at the site. Because the weight distribution in the cabinet is uneven, use extreme care during handling and transport. Your installation may also include Battery Cabinets, Maintenance Bypass Cabinets and a SlimLine Distribution Cabinet..

WARNING

EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 2,200 POUNDS TO 3,800 POUNDS. BATTERY CABINETS WEIGH BETWEEN 1,600 AND 5,050 POUNDS.

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING CABINET. TEST LIFT AND BALANCE THE CABINET BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES, NOT TO EXCEED 15 DEGREES.

THE MODULE AND BATTERY CABINETS CAN BE MOVED BY FORKLIFT. THE FORKS SHOULD BE INSERTED BETWEEN THE CASTER WHEEL ASSEMBLIES. FORKS MUST BE EXTENDED THE FULL DEPTH OF THE CABINET TO PROPERLY SUPPORT THE EQUIPMENT.

NOTE

To reduce the possibility of shipping damage, UPS cabinets are secured to the pallet as shown in the drawings at right. These packing elements must be carefully removed before attempting to remove the module from the pallet. Please follow these steps:

- *Cut the metal banding straps and remove.*
- *Unbolt and remove the four corner brackets retaining the 2x4 boards.*
- *Use forklift to remove module from pallet.*

CAUTION

Use extreme care not to strike the UPS cabinet when removing strapping and brackets.

Figure 2 Front view, Npower UPS module on pallet

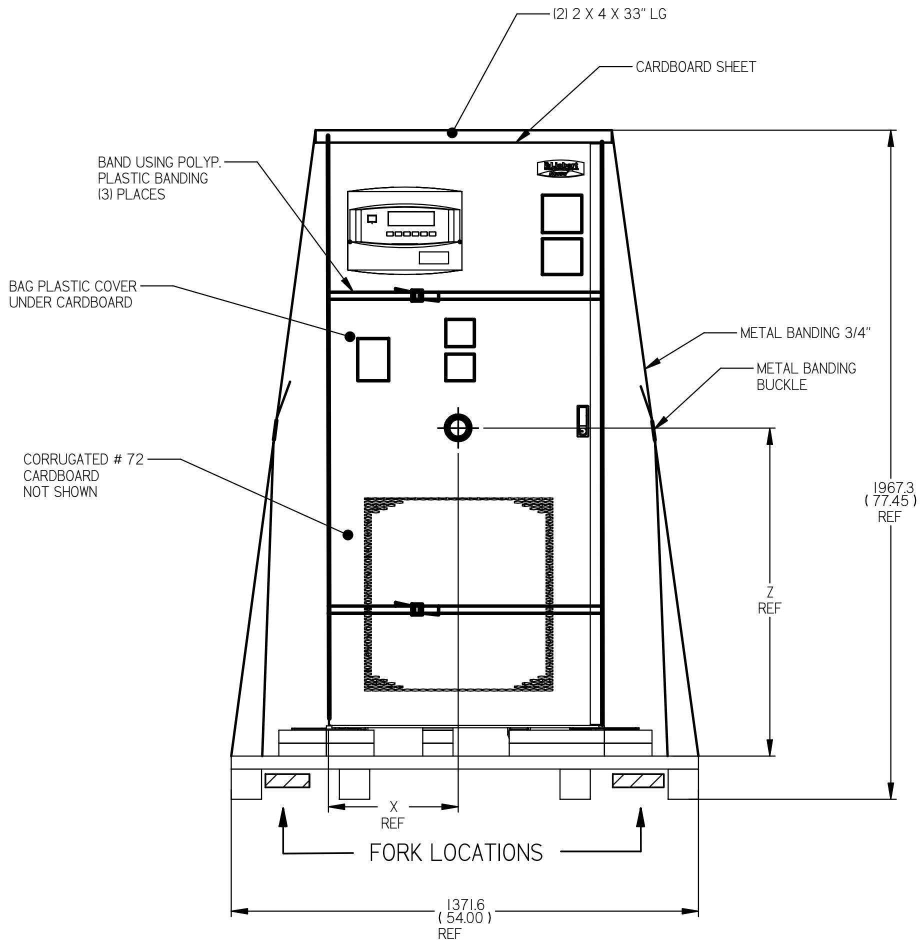
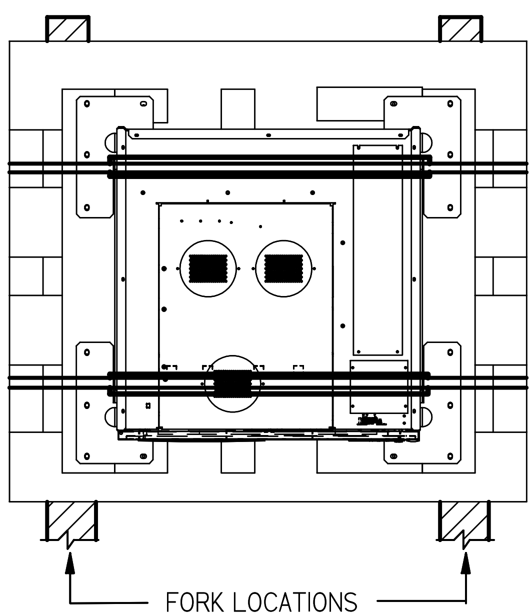


Figure 3 Top view, Npower UPS module on pallet



4.0 INSPECTIONS

4.1 External Inspections

1. While the UPS system is still on the truck, inspect the equipment and shipping container(s) for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours and contact Liebert Global Services at 1-800-543-2378 to inform them of the damage claim and the condition of the equipment.
2. Locate the bag containing the keys for the front access door. The bag is attached to the cabinet.
3. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier and to Liebert Global Services immediately.
4. Check the nameplate on the cabinets to verify that the model numbers correspond with the one specified. Record the model numbers and serial numbers in the front of this installation manual. A record of this information is necessary should servicing become required.

4.2 Internal Inspections

1. Verify that all items have been received.
2. If spare parts were ordered, verify arrival.
3. Open doors and remove cabinet panels to check for shipping damage to internal components.
4. Check for loose connections or unsecured components in the cabinet(s).
5. Check for any unsafe condition that may be a potential safety hazard.

5.0 Equipment Location

5.1 General Instructions

1. Handle cabinet(s) in accordance with the safety precautions in Section 1.0**.** If necessary, use a suitable material handling device to remove cabinet from the shipping pallet. **Exercise extreme care because of the uneven weight distribution.** Carefully lower the cabinet to the floor. The casters should enable the UPS to be pushed to the installation location.
2. Verify that the UPS system is installed in a clean, cool and dry location.
3. Installation and serviceability will be easier if adequate access is provided on all sides of the equipment, but only front access is required.
   a. Verify that there is adequate clearance to open cabinet doors. See drawings and local codes. Liebert recommends 3 feet (or 1 meter) of service clearance.
   b. Verify that there is adequate area in front of cabinet to perform maintenance. Check with local codes.
   c. Verify that there is adequate clearance above all cabinets to allow exhaust air to flow without restriction (2 feet minimum, unobstructed). If power and control wiring are routed into the top of the UPS, ensure that the conduit or wireway does not obstruct removal of the UPS top panel.

NOTE

The UPS has leveling feet to prevent the UPS from rolling on its casters after installation. The leveling feet are not designed to carry the full weight of the UPS. Turn the feet by hand until "finger-tight" against the floor. Then tighten a small amount with a wrench (less than two turns) to give a good friction fit against the floor. When using seismic anchoring, ensure that the casters are bearing the weight of the UPS.

NOTE

The Npower Battery Cabinet comes in versions specific to either the left or right side of the UPS. Control wires and power cables are cut to different lengths for the different versions. For systems with multiple battery cabinets, the cabinets have different part numbers indicating placement of the cabinet relative to the UPS. An "A" or "1" designation means the cabinet is adjacent to the UPS. Cabinet "B" will be adjacent to cabinet "A" and cabinet "C" (if applicable) will adjacent to cabinet "B."

NOTE

If the system includes a matching Npower Maintenance Bypass Cabinet (MBC), the MBC is generally attached to the right side of the UPS, closest to the UPS bus bars. The Battery Cabinet(s) would then be mounted to the left side of the UPS. However, both the MBC and Battery Cabinets are available in both left-side and right-side configurations to meet site-specific requirements.

5.2 Special Considerations for 1+1 Redundant Systems

1. Consider the grounding configuration of your system before finalizing module placement. For optimal grounding performance, the Npower modules should be close together.
2. For optimal load-sharing performance, the UPS output power cables should be approximately the same length, plus-or-minus 20 percent.
3. Position modules in such a way as to minimize the length of power cables and control wiring between UPS modules and the paralleling cabinet.
4. Battery cabinets should generally be positioned to the left side of the UPS modules, to make it easier to connect the UPS output bus bars to the Paralleling Cabinet or Panelboard.

6.0 Battery Installation

6.1 Battery Safety Precautions

Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

When replacing batteries, use the same number and type of batteries.

CAUTION

Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state, and local regulations. Because lead is a toxic substance, lead-acid batteries should be recycled rather than discarded.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. Do not dispose of battery or batteries in a fire. The battery may explode.

A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

1. **Remove watches, rings, or other metal objects.**
2. **Use tools with insulated handles.**
3. **Wear rubber gloves and boots.**
4. **Do not lay tools or metal parts on top of batteries.**
5. **Disconnect charging source prior to connecting or disconnecting battery terminals.**
6. **Determine if battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.**

Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following procedures should be followed:

1. **DO NOT SMOKE when near batteries.**
2. **DO NOT cause flame or spark in battery area.**
3. **Discharge static electricity from body before touching batteries by first touching a grounded metal surface.**

Battery Safety Precautions in French Per CSA Requirements

Instructions Importantes Concernant La Sécurité

Conserver Ces Instructions

ADVERTISSEMENT
DES PIECES SOUS ALIMENTATION SERONT LAISSEES SANS PROTECTION DURANT CES PROCEDURES D'ENTRETIEN. UN PERSONNEL QUALIFIE EST REQUIS POUR EFFECTUER CES TRAVAUX.

LES FUSIBLES A C.C. DE LA BATTERIE D'ACCUMULATEURS OPERENT EN TOUT TEMPS A LA TENSION NOMINALE. LA PRESENCE D'UN FUSIBLE A C.C. BRULE INDIQUE UN PROBLEME SERIEUX. LE REMPLACEMENT DE CE FUSIBLE, SANS AVOIR DETERMINE LES RAISONS DE LA DEFECTUOSITE, PEUT ENTRAINER DES BLESSURES OU DES DOMMAGES SERIEUX A L'EQUIPEMENT. POUR ASSISTANCE, APPELER LE DEPARTEMENT DE SERVICE A LA CLIENTELE DE LIEBERT.

DANGER
Les accumulateurs plomb-acide contiennent de la matière comportant un certain risque. Les accumulateurs doivent être manipulés, transportés et recyclés ou éliminés en accord avec les lois fédérales, provinciales et locales. Parce que le plomb est une substance toxique, les accumulateurs plomb-acide devraient être recyclés plutôt qu'éliminés.

Il ne faut pas brûlé le ou les accumulateurs. L'accumulateur pourrait alors explosé.

Il ne faut pas ouvrir ou endommager le ou les accumulateurs. L'électrolyte qui pourrait s'en échapper est dommageable pour la peau et les yeux.

Un accumulateur représente un risque de choc électrique et de haut courant de court-circuit. Lorsque des accumulateurs sont manipulés, les mesures préventives suivantes devraient être observées:

1. **Retirer toutes montre, bagues ou autres objets métalliques.**
2. **Utiliser des outils avec manchon isolé.**
3. **Porter des gants et des bottes de caoutchouc.**
4. **Ne pas déposer les outils ou les pièces métalliques sur le dessus des accumulateurs.**
5. **Interrompre la source de charge avant de raccorder ou de débrancher les bornes de la batterie d'accumulateurs.**
6. **Déterminer si l'accumulateur est mis à la terre par erreur. Si oui, défaire cette mise à la terre. Tout contact avec un accumulateur mis à la terre peut se traduire en un choc électrique. La possibilitié de tels chocs sera réduité si de telles mises à la terre sont débranchées pour la durée de l'installation ou de l'entretien.**

Les accumulateurs plomb-acide présentent un risque d'incendie parce qu'ils génèrent des gaz à l'hydrogène. Les procédures suivantes devront être respectées.

1. **NE PAS FUMER lorsque près des accumulateurs.**
2. **NE PAS produire de flammes ou d'étincelles près des accumulateurs.**
3. **Décharger toute électricité statique présente sur votre corps avant de toucher un accumulateur en touchant d'abord une surface métallique mise à la terre.**

⚠ **DANGER**

L'électrolyte est un acide sulfurique dilué qui est dangereux au contact de la peau et des yeux. Ce produit est corrosif et aussi conducteur electrique. Les procédures suivantes devront être observées:

1. **Porter toujours des vêtements protecteurs ainsi que des lunettes de protection pour les yeux.**
2. **Si l'électrolyte entre en contact avec la peau, nettoyer immédiatement en rincant avec de l'eau.**
3. **Si l'électrolyte entre en contact avec les yeux, arroser immédiatement et généreusement avec de l'eau. Demander pour de l'aide médicale.**
4. **Lorsque l'électrolyte est renversée, la surface affectée devrait être nettoyée en utilisant un agent neutralisant adéquat. Une pratique courante est d'utiliser un mélange d'approximativement une livre (500 grammes) de bicarbonate de soude dans approximativement un gallon (4 litres) d'eau. Le mélange de bicarbonate de soude devra être ajouté jusqu'à ce qu'il n'y ait plus apparence de réaction (mousse). Le liquide résiduel devra être nettoyé à l'eau et la surface concernée devra être asséchée.**

6.2 Matching Battery Cabinets

Two sizes of optional battery cabinets are available. Refer to **Figure 14** and **Figure 15.** The same model battery cabinet may be paralleled in multiple cabinet strings for additional capacity. Battery capacity (in minutes) at your installation will depend on cabinet model, number of cabinets, and amount of critical load on the UPS.

1. **Handling.** The Battery Cabinet has casters to facilitate movement over short distances. The bottoms of the Battery Cabinets are reinforced to permit movement by forklift over longer distances.
2. **Cabinet Inspection.** Remove all panels and visually inspect the batteries, bus connections, and cabinet for any damage. **Exercise caution; voltage is present within the Battery Cabinet even before installation.** If there are signs of damage, do not proceed. Call Liebert Global Services at 1-800-542-2378.
3. **Battery Storage.** The batteries used in the Battery Cabinet have an excellent charge retaining characteristic. The batteries can be stored for up to six months without any appreciable deterioration. Self-discharge rate of the batteries is approximately 3% per month when the batteries are stored in temperatures of 15°C to 25°C (59°F to 77°F). If the Battery Cabinet is planned to be stored for longer than six months or at temperatures higher than 25°C, contact Liebert Customer Service for recommended action.
4. **Installation.** The Battery Cabinet(s) can be located conveniently next to each UPS module, and are also available in stand-alone configurations with painted side panels. The front-access-only-design eliminates side and rear service clearance requirements.
    - **Environment.** Locate the Battery Cabinet in a clean, dry environment. Recommended temperature range for optimum performance and lifetime is 20°C (68°F) to 25°C (77°F).
    - **Position.** The Npower Battery Cabinet comes in versions specific to either the left or right side of the UPS. Control wires and power cables are cut to different lengths for the different versions. For systems with multiple battery cabinets, the cabinets have different part numbers indicating placement of the cabinet relative to the UPS. An “A” or “1” designation means the cabinet is adjacent to the UPS. Cabinet “B” will be adjacent to cabinet “A” and cabinet “C” (if applicable) will adjacent to cabinet “B.” If the system includes a matching Maintenance Bypass Cabinet (MBC), the MBC should be mounted to the right of the UPS (nearest the bus bars) and the battery cabinet(s) should be installed to the left of the UPS. Likewise left-side placement of the battery cabinet is preferable for 1+1 systems.
    - **Service Clearance.** Allow front access to the Battery Cabinet at all times for maintenance and servicing. Electrical codes require that the Battery Cabinet be installed with no less than 3 feet (1 meter) of clearance at the front of the cabinet when operating. Side and rear panels do not require service clearance.
    - **Cables.** Cables may be run between the cabinets through cutouts in the top of the cabinet, eliminating the need for external conduit runs. **Route cables before moving cabinets into final position for bolting together.** Remove top panels for access, if required. No top or bottom entry cables are required, except for remotely located cabinets which require conduits. Refer to **Figure 14**, **Figure 15 and Figure 33.**
    - **Bolt-On Cabinets.** Matching Battery Cabinets are designed to bolt onto the side of the UPS module cabinet. Use bolts (3/8"-16 x 1-1/4") to connect cabinet frames at posts, two places front and two places rear. As mentioned above, stand-alone cabinets are also available.
    - **Software Consideration.** The number of battery cabinets must be noted when performing initial startup and setup on the UPS screen.
    - **Casters and Leveling Feet.** The leveling feet are not designed to bear the full weight of the cabinet. Lower the feet until they are “finger-tight” in contact with the floor. Then tighten a small amount with a wrench (less than two turns) to give a good friction fit. When mounting the battery cabinet on seismic stands, ensure that the casters are bearing the weight of the cabinet.
    - **Battery Support Tray.** Be sure to connect the Battery Support Tray to the front of the cabinet before sliding a battery tray out for connection or service. Without the Support Tray in place, the weight of the batteries could cause the tray to fall out of the cabinet. See **Figure 14** and **Figure 15** for details.

6.3 Non-Standard Batteries

When batteries other than a matching Battery Cabinet are used, a remote battery disconnect switch with overcurrent protection is required per the National Electrical Code. Contact your Liebert sales representative regarding this option.

1. Install battery racks/cabinets and batteries per manufacturer’s installation and maintenance instructions.
2. Verify battery area has adequate ventilation and battery operating temperature complies with manufacturer’s specification.

If you have any questions concerning batteries, battery racks, or accessories, contact Liebert Global Services at 1-800-543-2378.

7.0 CONFIGURING YOUR NEUTRAL AND GROUND CONNECTIONS

Improper grounding is the largest single cause of UPS installation and start-up problems. This is not a simple subject, since grounding techniques vary significantly from site to site, depending on several factors. The two main concerns are the configuration of the Npower UPS and the type of load connected to the UPS.

- **Npower UPS Configuration.** The Npower can be ordered with an optional isolated neutral for sites that do not have grounded-wye (4-wire + ground) source power available. If the building service is straight delta or corner-grounded delta, the Npower UPS must be configuration D/E or R/S (K/L or X/Y for models with input isolation transformers). The UPS configuration is the 12th digit in the model number, or 4th digit from the right.

NOTE

It is important to inform your Liebert sales representative if your site has anything except solidly grounded wye input, so the isolated-neutral configuration can be ordered. This configuration cannot be created in the field by modifying a standard UPS.

- **"3-Wire" vs. "4-Wire" Loads.** The simplest loads are "3-wire" -- those which require the three phase conductors plus the ground conductor. Typical 3-wire loads are Power Distribution Units (PDUs) containing isolation transformers. "4-wire" loads are those which require the three phase conductors plus the ground conductor plus a neutral conductor. Typical 4-wire loads are transformerless PDUs supporting single-phase (phase-to-neutral) loads.

The following sections discuss recommended grounding procedures for various system configurations.

NOTES

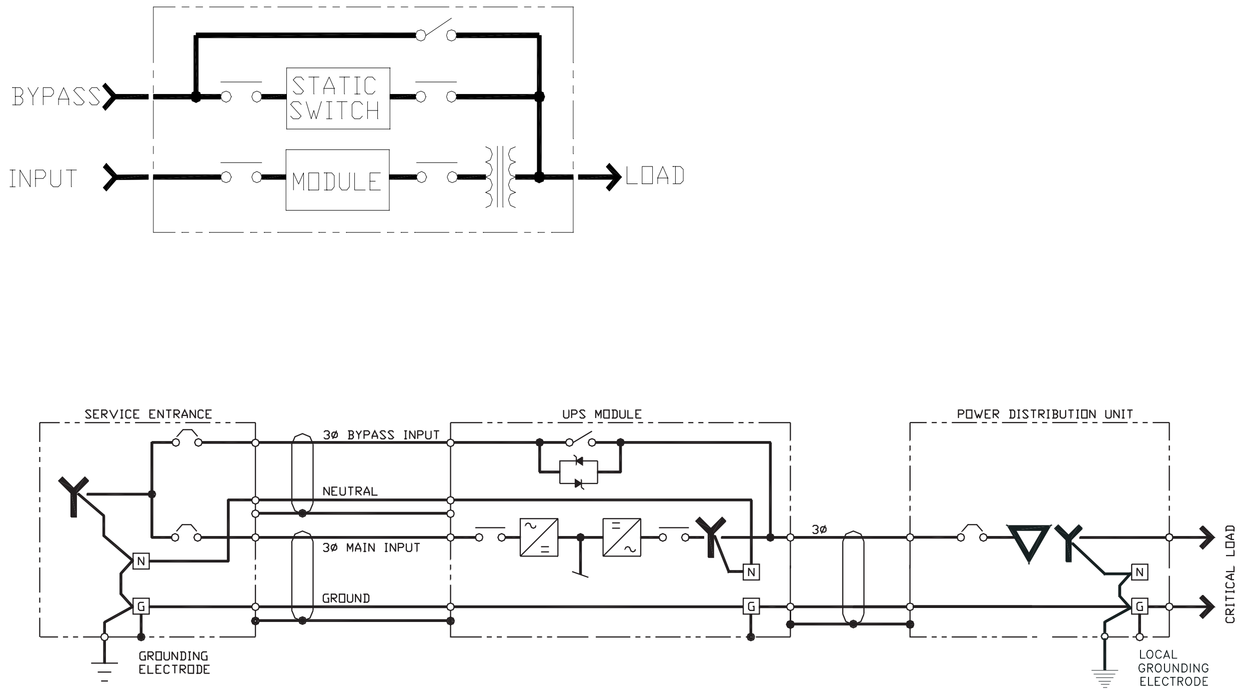
1. UPS modules with matching Maintenance Bypass Cabinets are generally grounded exactly like those that do not have them. However, if the Maintenance Bypass Cabinet includes a Bypass Isolation Transformer, the neutral-to-ground bond will be made inside the Bypass Cabinet. The Maintenance Bypass Cabinet neutral will be solidly connected to the UPS neutral. The customer power terminations will be made in the Maintenance Bypass Cabinet instead of in the UPS module.

2. Some UPS modules are equipped with input isolation transformers. However, these transformers have no effect upon any system grounding considerations. These modules will be grounded exactly as shown in the following examples.

3. All the diagrams on the following pages depict dual-input UPS modules, for clarity. Single-input UPS modules are grounded exactly the same way.

4. Every conduit or bus duct carrying phase wiring into or out of the UPS must also contain a grounding conductor. Solid-metal conduit is not a suitable grounding conductor for the Npower UPS or its connected loads. In particular, a grounding conductor must be in the conduit bringing the phase conductors from the service entrance.

Figure 4 Grounding Diagram, A/B or G/H UPS Models, Wye Source, 3-Wire Loads



7.1 Grounding for A/B or G/H UPS Models, Wye Source, 3-Wire Loads

A common configuration of Npower UPS is with 480 VAC input, 480 VAC output, and a connected load consisting of one or more Power Distribution Units (PDUs) with isolation transformers in the PDUs to produce 208 VAC. For Canadian customers, the UPS modules usually have 600 VAC input and output. The same principles apply if the connected load is an isolation transformer feeding various loads. **Figure 4** above shows a typical installation.

Notice that the UPS input is connected to a grounded-wye service. In this configuration, the critical load does not require a neutral from the UPS. However, the UPS neutral is solidly connected to the service-entrance neutral, and there is no neutral-to-ground bond at the UPS. The installing contractor must bring a neutral conductor from the service entrance to the UPS neutral.

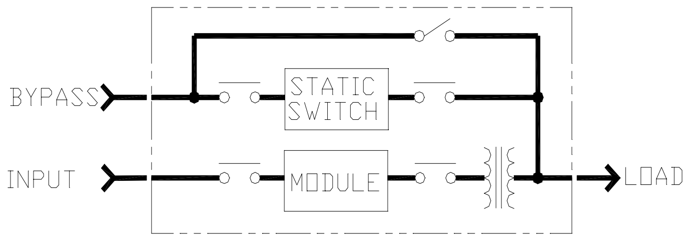
The isolation transformer in the PDU is a separately derived source. Therefore the PDU neutral should be bonded to the PDU ground terminal and connected to a local grounding electrode in compliance with NEC.

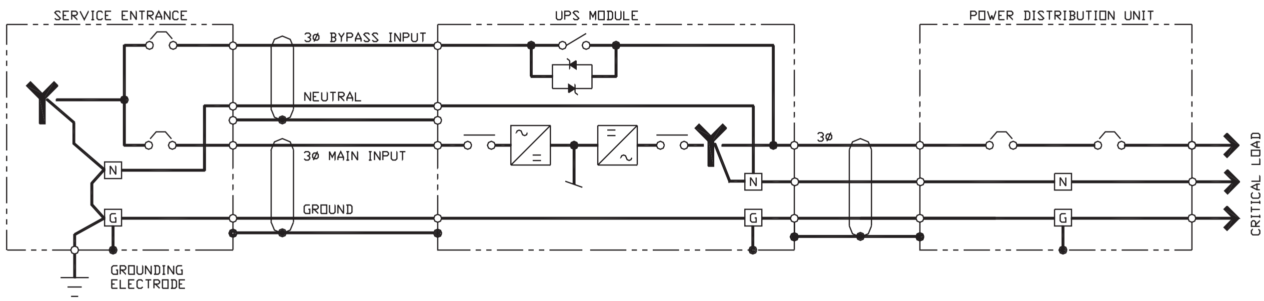
This UPS system may include a Maintenance Bypass Cabinet. The Maintenance Bypass Cabinet neutral will be solidly connected to the UPS output neutral, which will be solidly connected to the service-entrance neutral.

NOTES

Ungrounded and corner-grounded delta sources require that the Npower be furnished from the factory with an Isolated Load Neutral, as described in later sections.

Figure 5 Grounding Diagram, A/B or G/H UPS Models, Wye Source, 4-Wire Loads





7.2 Grounding for A/B or G/H UPS Models, Wye Source, 4-Wire Loads

This configuration is common in applications where the UPS input is 208 VAC and the load is a PDU (or a bolt-on Slim Line Distribution Unit) directly powering phase-to-neutral (4-wire) loads.

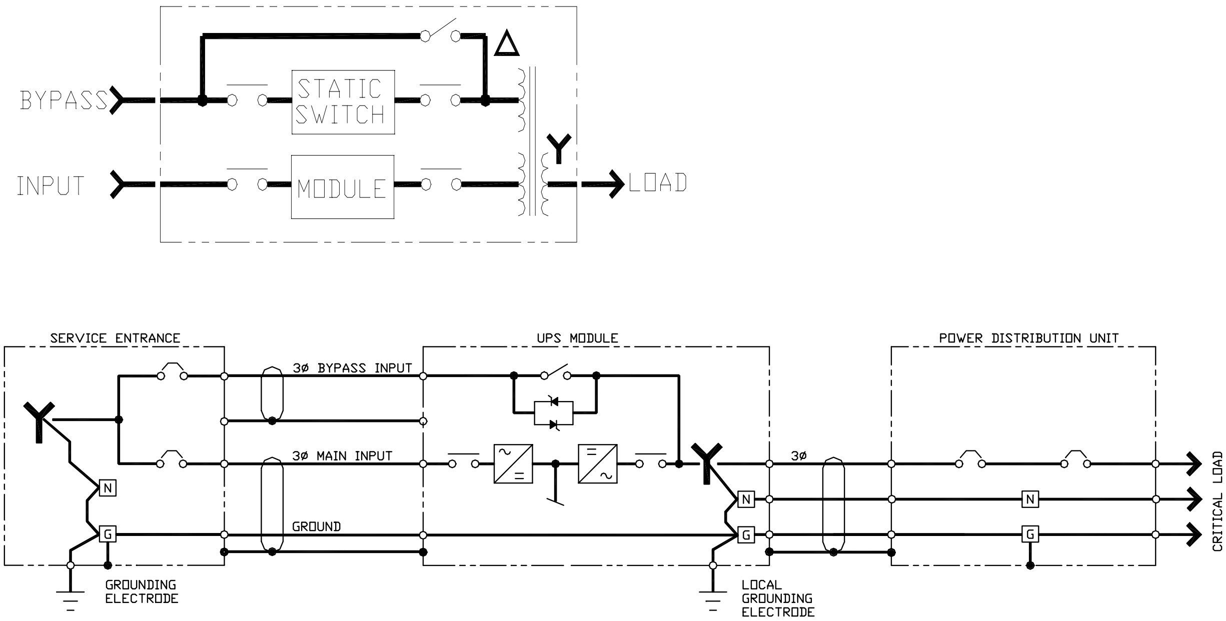
This configuration is similar to that shown in Section 7.1 because the installing contractor must bring a neutral conductor from the service entrance to the UPS neutral.

This UPS system may include a Maintenance Bypass Cabinet. The Maintenance Bypass Cabinet neutral will be solidly connected to the UPS output neutral, and will also be solidly connected to the service entrance neutral.

NOTES

Ungrounded and corner-grounded delta sources require that the Npower be furnished from the factory with an Isolated Load Neutral, as described in later sections.

Figure 6   Grounding Diagram, D/E or K/L UPS Models, Delta or Wye Source, 4-Wire Loads



7.3 Grounding for D/E or K/L UPS Models, Delta or Wye Source, 3- or 4-Wire Loads

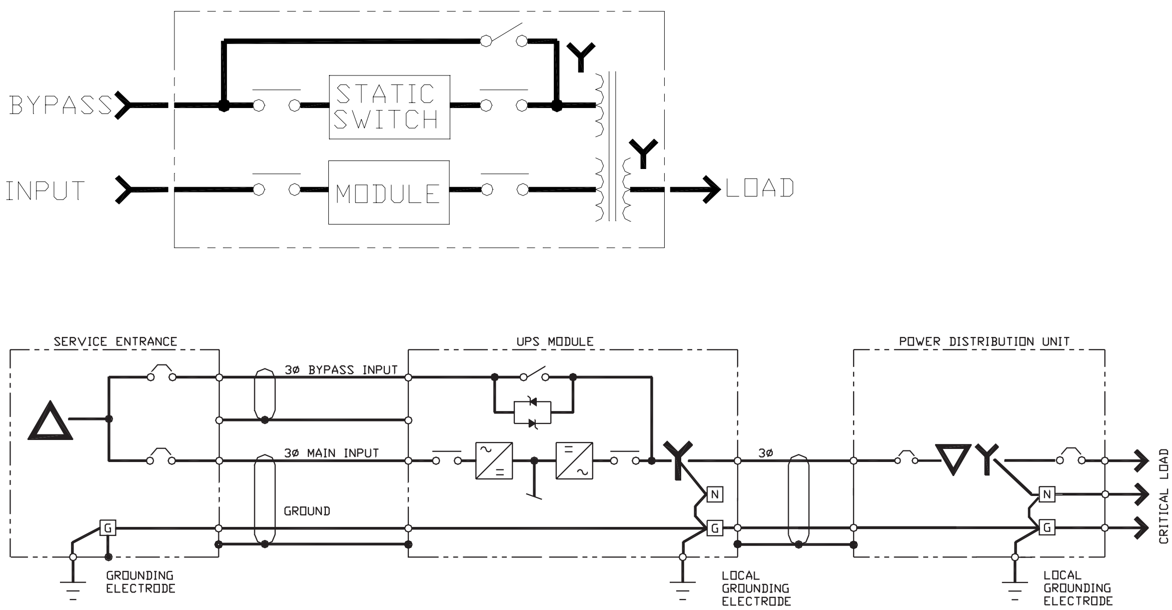
The D/E and K/L models have the isolated load neutral, and can be used in any 3-wire or 4-wire application. In this case, the UPS neutral is solidly connected to the UPS ground, and a local grounding electrode is installed in accordance with the NEC.

This UPS system may include a Maintenance Bypass Cabinet containing a Bypass Isolation Transformer. The Bypass Isolation Transformer neutral will be bonded to its ground. The UPS output neutral will be solidly connected to the Bypass Isolation Transformer neutral.

NOTES

Ground-Fault Interrupters should be set to tolerate approximately 30 cycles (500 milliseconds) of recirculating current that may be present during transfer and retransfer operations.

Figure 7 Grounding Diagram, R/S or X/Y UPS Model, Delta Source, 3-Wire Loads



7.4 Grounding for R/S or X/Y UPS Models, Delta Source, 3-Wire Loads

If building service is ungrounded delta or corner-grounded delta, the Npower UPS must have the isolated load neutral.

In this case, the UPS neutral is solidly connected to the UPS ground, and a local grounding electrode is installed in accordance with the NEC.

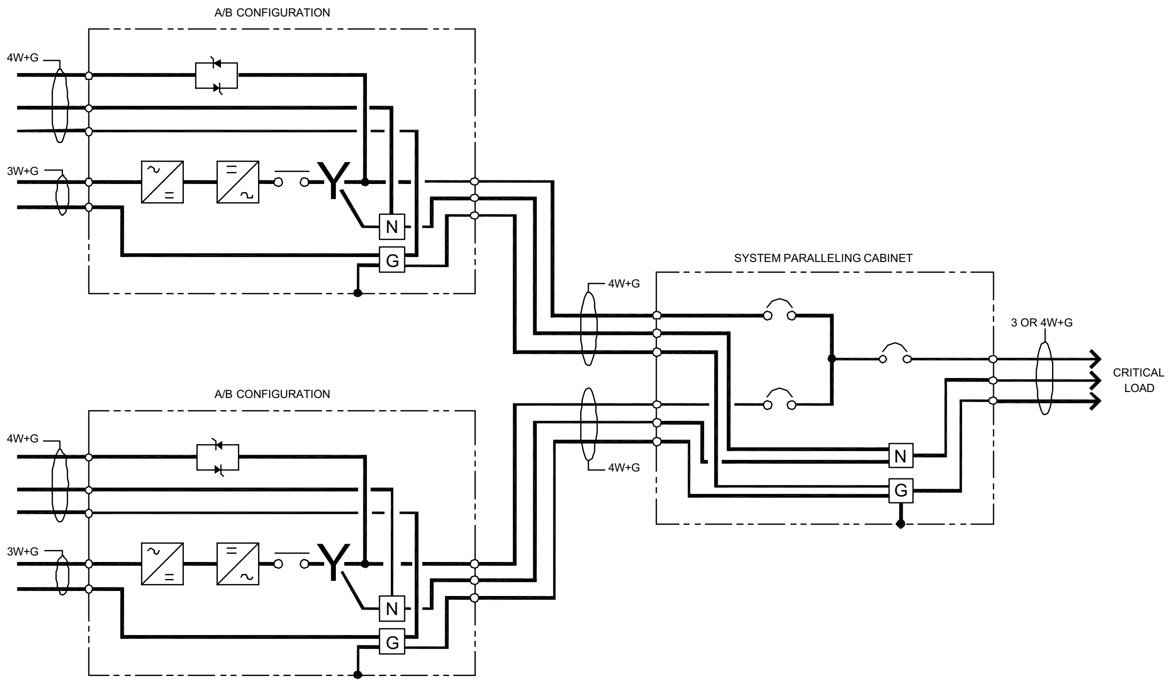
This UPS system may include a Maintenance Bypass Cabinet containing a Bypass Isolation Transformer. The Bypass Isolation Transformer neutral will be bonded to its ground. The UPS output neutral will be solidly connected to the Bypass Isolation Transformer neutral.

NOTES

1. The R/S and X/Y models can only support 3-wire loads.

2. Ground-Fault Interrupters should be set to tolerate approximately 30 cycles (500 milliseconds) of recirculating current that may be present during transfer and retransfer operations.

Figure 8 Grounding Diagram, A/B or G/H UPS Models, 1+1 Configuration



7.5 Grounding for A/B or G/H UPS Models, 1+1 Configuration

There are two methods for grounding A/B or G/H models in a 1+1 configuration. One option, shown above, is an extension of the configuration shown in **Figures 4 and 5**, where each UPS module is solidly connected to the building service neutral. Both UPS module neutrals are then solidly connected to the Paralleling Cabinet Neutral. This option is especially applicable when an existing A/B or G/H installation is upgraded to the 1+1 configuration. For three-wire loads, it is not necessary to connect a neutral conductor to the Paralleling Cabinet. For four-wire loads, each UPS module neutral will need to be solidly connected to the Paralleling Cabinet neutral.

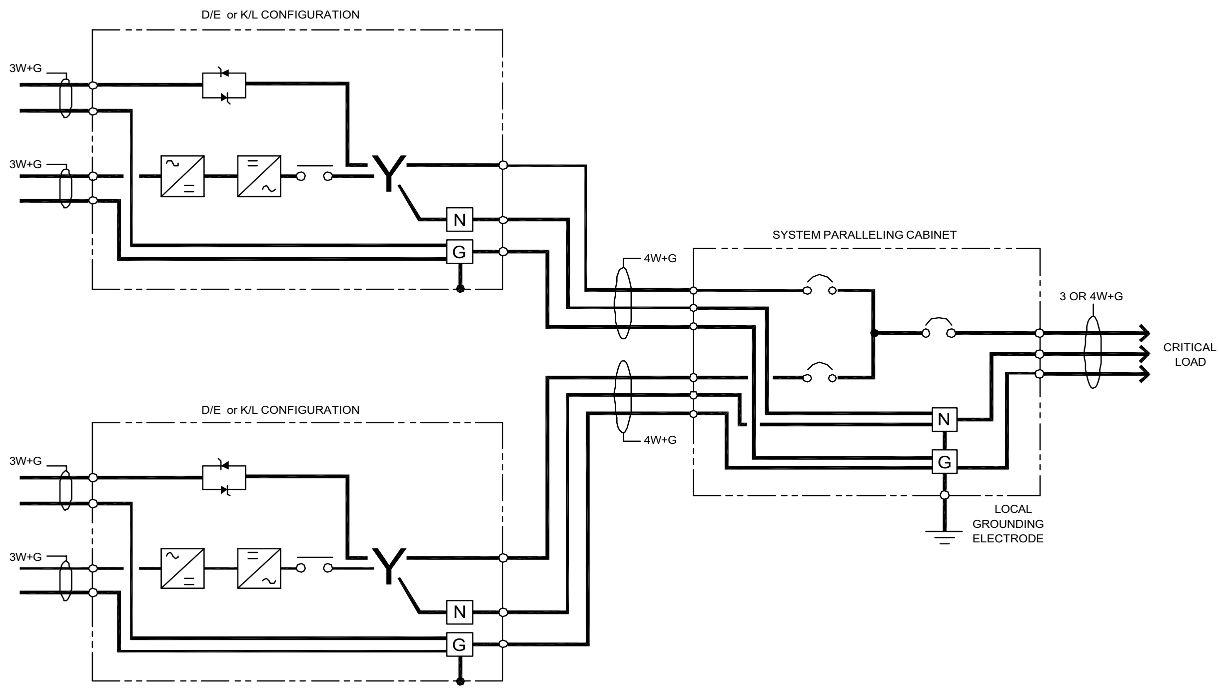
The other option (not shown) for supporting four-wire loads is to run a single neutral conductor from the service entrance to the Paralleling Cabinet neutral. Both UPS modules will then have their output neutrals solidly connected to the Paralleling Cabinet neutral.

For either configuration, there must *not* be a neutral-to-ground bond inside the Paralleling Cabinet or inside either UPS module.

NOTES

Both UPS modules must share a common bypass source.

Figure 9 Grounding Diagram, D/E or K/L UPS Models, 1+1 Configuration



7.6 Grounding for D/E or K/L UPS Models, 1+1 Configuration

When using D/E or K/L models in a 1+1 Configuration, both UPS modules will have their output neutrals solidly connected to the Paralleling Cabinet neutral. The neutral-to-ground bond *must* be located inside the Paralleling Cabinet. There *must not* be a neutral-to-ground bond in either UPS module.

Although not pictured above, a local grounding electrode must be installed at the Paralleling Cabinet.

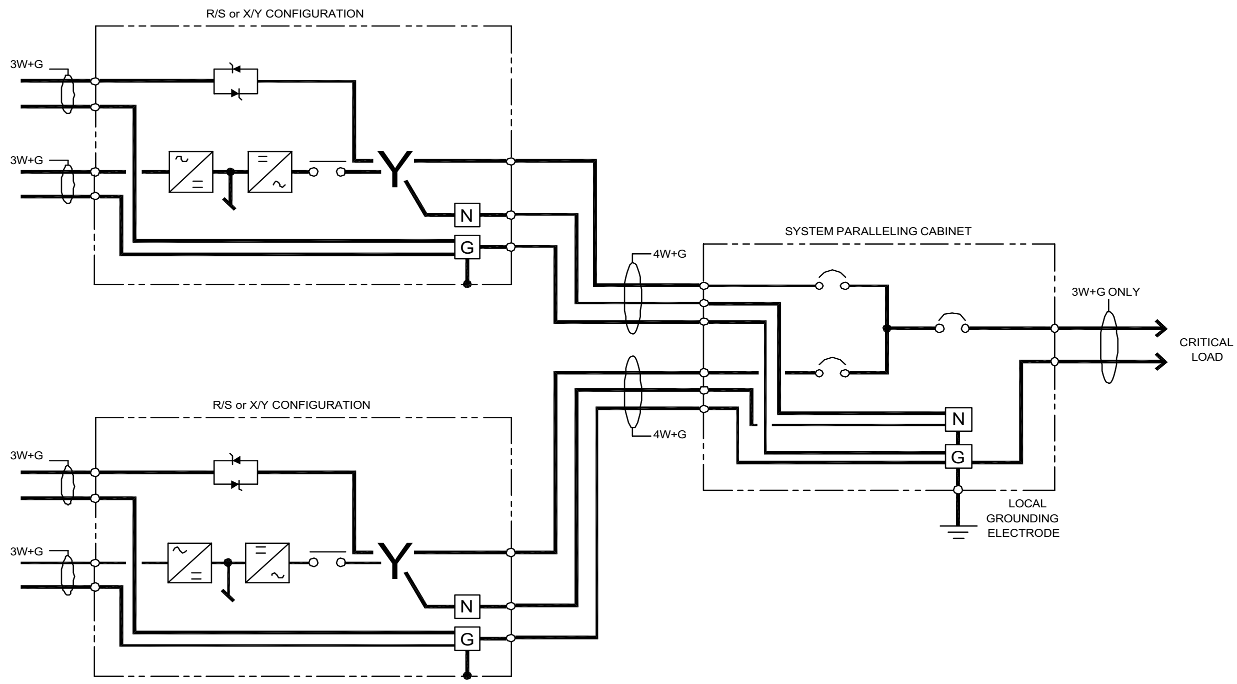
This configuration will support either 3-wire or 4-wire loads.

NOTES

1. D/E and K/L UPS modules normally ship with a neutral-to-ground bond inside the UPS. Verify that this bond has been removed from both modules before connecting the modules to the Paralleling Cabinet.

2. Ground-Fault Interrupters should be set to tolerate approximately 30 cycles (500 milliseconds) of recirculating current that may be present during transfer and retransfer operations.

Figure 10 Grounding Diagram, R/S or X/Y UPS Models, 1+1 Configuration



7.7 Grounding for R/S or X/Y UPS Models, 1+1 Configuration

When using R/S or X/Y models in a 1+1 configuration, the UPS module neutrals are solidly connected to the Paralleling Cabinet neutral. The neutral-to-ground bond *must* be located inside the Paralleling Cabinet. There *must not* be a neutral-to-ground bond inside either UPS module.

Although not pictured above, a local grounding electrode must be installed at the Paralleling Cabinet.

This configuration will only support 3-wire loads.

NOTES

1. R/S and X/Y UPS modules normally ship with a neutral-to-ground bond inside the UPS. Verify that this bond has been removed from both modules before connecting the modules to the Paralleling Cabinet.

2. Ground-Fault Interrupters should be set to tolerate approximately 30 cycles (500 milliseconds) of recirculating current that may be present during transfer and retransfer operations.

7.8 Grounding for 2 Npower UPS Modules feeding a Static Transfer Switch

Any version of Npower UPS module can be applied in a dual-bus (distributed redundant) configuration. Both Npower modules will be grounded exactly as shown in **Figure 4** through **Figure 7** of this manual.

The recommended configuration is to have each UPS module provide 3-wires+ground to an isolation transformer on the input of the Static Transfer Switch. The neutrals of the two isolation transformers will be solidly connected, and bonded to the ground of one transformer. A local grounding electrode will then be applied to the bonded transformer.

At this time, Liebert does not support having two Npower modules provide 4-wire input directly to the Static Transfer Switch to directly support 208Y/120 VAC loads on the output of the Static Transfer Switch.

7.9 Grounding Configurations, Battery Systems

Large, open-rack battery systems are normally locally grounded. Refer to the code requirements for your region.

Battery cabinet frames, on the other hand, should be grounded to the UPS module ground busbar. For systems with multiple cabinets, the installer can connect all the battery cabinet grounds together and run a single ground conductor to the UPS module ground busbar.

8.0 WIRING CONSIDERATIONS

WARNING
ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN THAT IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENT OR INJURY TO PERSONNEL.

VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

Refer to **Appendix A: Site Planning Data** and installation drawings **(Figure 11** through **Figure 37).** Determine AC currents for your system (kVA, voltage, and options). Also refer to equipment nameplate for the model number, rating, and voltage. Refer to **Table 1** and **Table 2** for wire termination data.

NOTE
*Use 75°C copper wire. Select wire size based on the ampacities in **Table 3** of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).*

NOTE
Interconnecting control wiring should be run in a separate conduit from the power wiring.

CAUTION
The weight of power cables must be adequately supported to avoid stress on bus bars and lugs. In addition to weight support, the following restraining method is recommended to control cable movement during external fault conditions: Wrap line cables together at 6 inches and 12 inches from the terminals with 5 wraps of 3/8 inch nylon rope or equivalent (tensile strength of 2000 pounds). Support remainder of cable with 5 wraps every 6 inches or 1 wrap every 1 inch.

NOTE
The Npower UPS requires site-furnished overcurrent protection devices for rectifier input, bypass input and UPS output. These devices can be ordered as part of the optional Maintenance Bypass Cabinet or furnished by the installing contractor.

8.1 Power Wiring

1. Power wiring must be run in individual, separate conduits or cable trays. Refer to the installation drawings (**Figure 11** to **Figure 36**) for locations of the various power connections within the UPS and ancillary cabinets. In particular, note the location of the various power connections.

> ⚠ **CAUTION**
> **Power and control wiring must be separated.**

2. Observe local, state and national electrical codes. Verify utility power and its overcurrent protection rating will accommodate the UPS input rating, including battery recharging.
3. A safety ground wire must be run from building ground to the ground point in the UPS cabinets. See Sections 7.1 through 7.4. The grounding conductor shall comply with the following conditions of installation:
   a. An insulated grounding conductor must be sized in accordance with the NEC and local codes. It must be green (with or without one or more yellow stripes) and be installed as part of the branch circuit that supplies the unit or system.
   b. The grounding conductor described above is to be grounded to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set in accordance with the instructions in Section 7 of this Manual.
   c. A grounding conductor must be supplied with the current-carrying conductors in each conduit.
   d. The attachment-plug receptacles in the vicinity of the unit or system are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.
4. Observe clockwise phase rotation of all power wiring. Phase A leads Phase B leads Phase C. A qualified electrician should check the phase rotation.
5. Power cables must be rated for less than 2 volts line drop at maximum rated system current.
6. If site equipment includes a backup generator and automatic transfer switch(es), consult the manufacturers of those devices for information on sizing and interfacing to the UPS system.
7. The installing contractor can remove the access plates from the cable-access areas in the top and bottom of the UPS in order to cut entry holes for conduit..

> ⚠ **CAUTION**
> **After cutting holes in the access plates, be certain that no foreign matter (metal shavings, sawdust, insulation or wire fragments, etc.) remains inside the UPS. Likewise be certain to block any “extra” holes in the plates through which foreign matter (or rodents) could later enter the UPS.**

8.2 Control Wiring

Control wiring must be stranded and tinned and run in individual separate steel conduits. Control wiring must be separated from power wiring. In addition, each control wiring cable group should be run in a separate conduit to minimize control signal interference.

If your system has any installed options, special wire lists will be included in your Submittal Drawing Package. Contact your Liebert Sales Representative for assistance if the submittal drawings have been lost or misplaced.

Figure 32 shows the typical location of control connections inside the UPS.

NOTE

The UPS control and communication wiring are considered Class 2 circuits by NEC standards. However, NEC Class 1 wiring methods are required for these circuits to ensure proper operation of the UPS.

8.3 Battery Wiring

Power wiring to the Battery Cabinet connects positive, negative, and ground power cables from the Battery Cabinet to the associated UPS. Connection of the UPS to the Battery Cabinet serves to both charge and discharge the batteries (when needed). The battery disconnect (circuit breaker) requires a control cable. Liebert Battery Cabinets that bolt to the UPS include power and control cables to join multiple cabinets together into a system. Additional (field-supplied) power or control wiring might be necessary to connect the battery cabinet system to the UPS.

When a site requires more than two battery cabinets, the Npower can be ordered with a Multiple Battery Breaker option. The option consists of a Multiple Battery Breaker (MBB) board that mounts on the control door and an Input Contact Isolator (ICI) board that mounts in the option area (See **Section 14** in the Options Manual.)

The ICI board allows the Npower system to sense multiple battery cabinets, and the MBB board allows the UPS to support multiple battery cabinets by supplying power to the UVR coil of additional battery cabinets.

Refer to **Figure 14**, **Figure 15**, **Figure 33** and **Figure 64**.

DANGER

A BATTERY INTERCELL CONNECTION ON EACH TIER OF THE LIEBERT BATTERY CABINET IS DISCONNECTED FOR SAFETY DURING SHIPMENT. DO NOT COMPLETE THESE CONNECTIONS. THE LIEBERT GLOBAL SERVICES REPRESENTATIVE WILL COMPLETE THESE CONNECTIONS AS PART OF START-UP. AN IMPROPERLY INSTALLED UNIT CAN RESULT IN INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.

CAUTION

Be sure polarity is correct when wiring the Battery Cabinet to the connected equipment (positive to positive; negative to negative). If polarity is not correct, fuse failures or equipment damage can result.

CAUTION

DC power cables should be installed in conduit with conductors in matched pairs (positive and negative).

NOTE

A Liebert Battery Specialist can perform a detailed inspection of the entire battery system to ensure it meets current IEEE standards. This inspection service is recommended because batteries are a very critical part of the UPS system.

9.0 WIRING CONNECTIONS

DANGER

VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ELECTRICAL CONNECTIONS.

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN EXPERIENCED IN WIRING UPS EQUIPMENT, AND IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES.

IMPROPER WIRING MAY CAUSE DAMAGE TO THE UPS OR INJURY TO PERSONNEL.

CAUTION

All shielded cables, non-shielded cables, non-shielded control wires, non-shielded battery breaker control wires, and non-shielded remote control wires must be housed in individual, separate, steel conduits. Placing multiple cables in the same conduit with other control or power wiring may cause system failure.

Refer to the drawings in this manual and any other drawings provided by Liebert for this installation. Make all of the following connections:

1. Connect optional Maintenance Bypass Cabinets (if applicable) to the UPS module using the appropriate factory-furnished cables.
2. Connect AC power cables from input power source circuit breaker to the input terminals of either the Maintenance Bypass Cabinet (if applicable) or the UPS module. Observe phase rotation.
3. If this is a dual-input UPS system (separate AC and bypass inputs), connect AC power cables from bypass power source circuit breaker to UPS system bypass input -- either at the Maintenance Bypass Cabinet or at the UPS module. Observe phase rotation.

CAUTION

See Section 7 of this Manual for an explanation of proper grounding techniques.

4. Connect AC power cables from UPS module (or Maintenance Bypass Cabinet) output to either the Slim Line distribution cabinet or to the switchgear for critical load bus. Observe phase rotation.

NOTE

Make sure all required wiring between the UPS module and the optional cabinet(s) is completed. Observe phase rotation.

5. The UPS module output neutral is connected as shown in **Figure 4** through **Figure 7**, depending on the UPS configuration.

CAUTION

UPS bypass and system output neutral must be connected to only one common point in the UPS system. This neutral line must be grounded at the source.

6. For Battery Cabinets:

   DC power cables (and ground) from Battery Cabinet to UPS Module, and between Battery Cabinets.

Observe polarity. DC power cables should be installed in matched pairs (positive and negative).

NOTE
DC power and battery circuit breaker control cables are provided with Liebert-brand Battery Cabinets that will be bolted to the UPS. Power cables are sized for interconnecting Battery Cabinets.

DANGER
DO NOT MAKE ANY CONNECTIONS BETWEEN BATTERY TIERS IN THE BATTERY CABINET. THESE CONNECTIONS WILL BE MADE BY THE LIEBERT CUSTOMER SERVICE REPRESENTATIVE DURING START-UP.

7. For remote battery, install DC power cables (and ground) from battery to Module Battery Disconnect, and then to UPS module DC bus. Observe polarity.
8. Connect Module Battery Disconnect control wiring to UPS module, and between Battery Cabinets if applicable.
9. Install wiring for control connections for the Maintenance Bypass.
10. Install power connections from critical bus switchgear to critical load bus. Observe phase rotation.
11. Install control wiring to Remote Monitor Panel or other communication options, if applicable. Wiring must be run in individual separate steel conduit.
12. Install Emergency Power Off control wiring in separate steel conduit.
13. Install any additional special wiring required at your site.

10.0 Wiring Inspection

1. Verify all power connections are tight.
2. Verify all control wire terminations are tight.
3. Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground.
4. Verify that all control wires are run in individual, separate, steel conduit.

Table 1 Power Wiring Terminals - Factory Supplied

UPS Module Rating	Connection Type
30-130 kVA	Bus bars. See Outline Drawings for dimensions.
Use 75°C copper wire. Select wire size based on the ampacities in **Table 310-16** (see **Table 3** of this manual) and associated notes of the National Electrical Code (NFPA 70). Use commercially available solderless lugs for the wire size required for your application. Connect wire to the lug using tools and procedures specified by the lug manufacturer.	

Table 2 Torque Specifications

Nut and Bolt Combinations				
	Grade 2 Standard		Electrical Connections with Belleville Washers	
Bolt Shaft Size	Lb-in	N-m	Lb-in	N-m
1/4	53	6.0	46	5.2
5/16	107	12	60	6.8
3/8	192	22	95	11
1/2	428	48	256	29

Circuit Breakers With Compression Lugs (For Power Wiring)		
Cable Size or Range	Lb-in	N-m
#6 - #4	100	11
#3 - #1	125	14
1/0 - 2/0	150	17
3/0 - 200 MCM	200	23
250 - 400 MCM	250	28
500 - 700 MCM	300	34
Terminal Block Compression Lugs (For Control Wiring)		
AWG Wire Size or Range	**Lb-in**	**N-m**
#22 - #14	3.5 to 5.3	0.4 to 0.6

Use the values in this table unless the equipment is labeled with a different torque value.

Table 3 Table 310-16

Allowable Ampacities of Insulated Conductors Rated 0-2000 Volts, 60° to 90°C (140° to 194°F)[1]

Not More than Three Conductors in Raceway or Cable or Earth (Directly Buried), based on Ambient Temperature of 30° (86°F)

Size	Temperature Rating of Conductor. See Table 310-13.						Size
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
AWG kcmil	**Types** TW* UF*	**Types** FEPW*, RH, RHW*, THHW*, THW*, THWN*, XHHW*, USE*, ZW*	**Types** TBS, SA, SIS FEP*, FEPB*, MI, RHH*, RHW-2, THHN*, THHW*, THW-2, THWN-2, USE-2, XHH, XHHW* XHHW-2, ZW-2	**Types** TW* UF*	**Types** RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*	**Types** TBS, SA, SIS, THHN*, THHW*, THW-2, THWN-2, RHH*, RHW-2, USE-2, XHH, XHHW*, XHHW-2, ZW-2	AWG kcmil
	Copper			**Aluminum or Copper-Clad Aluminum**			
18	....	....	14	....	....	....	....
16	....	....	18	....	....	....	....
14	20†	20†	25†	....	....	....	....
12	25†	25†	30†	20†	20†	25†	12
10	30	35†	40†	25	30†	35†	10
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000
Correction Factors							
Ambient Temp °C	**For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.**						**Ambient Temp °F**
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	.91	.94	.96	.91	.94	.96	87-95
36-40	.82	.88	.91	.82	.88	.91	96-104
41-45	.71	.82	.87	.71	.82	.87	105-113
46-50	.58	.75	.82	.58	.75	.82	114-122
51-55	.41	.67	.76	.41	.67	.76	123-131
56-60	....	.58	.71	....	.58	.71	132-140
61-70	....	.33	.58	....	.33	.58	141-158
71-80	....	....	.41	....	....	.41	159-176

* Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for conductor types marked with an asterisk (*) shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10 copper; or 15 amperes for No.12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperature and number of conductors have been applied.

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11.0 INSTALLATION DRAWINGS

Figure 11 Outline Drawing, 30-50 kVA UPS

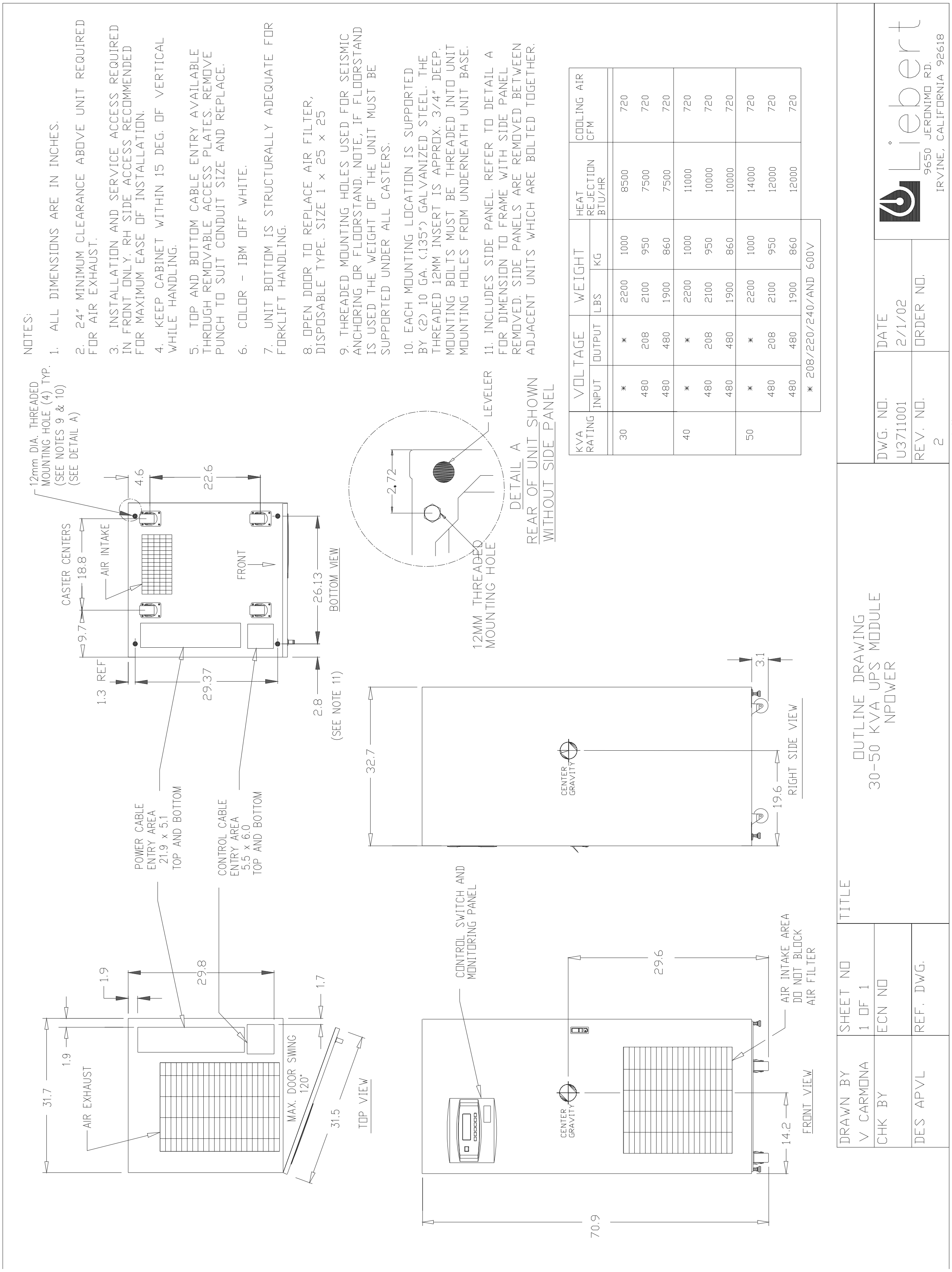
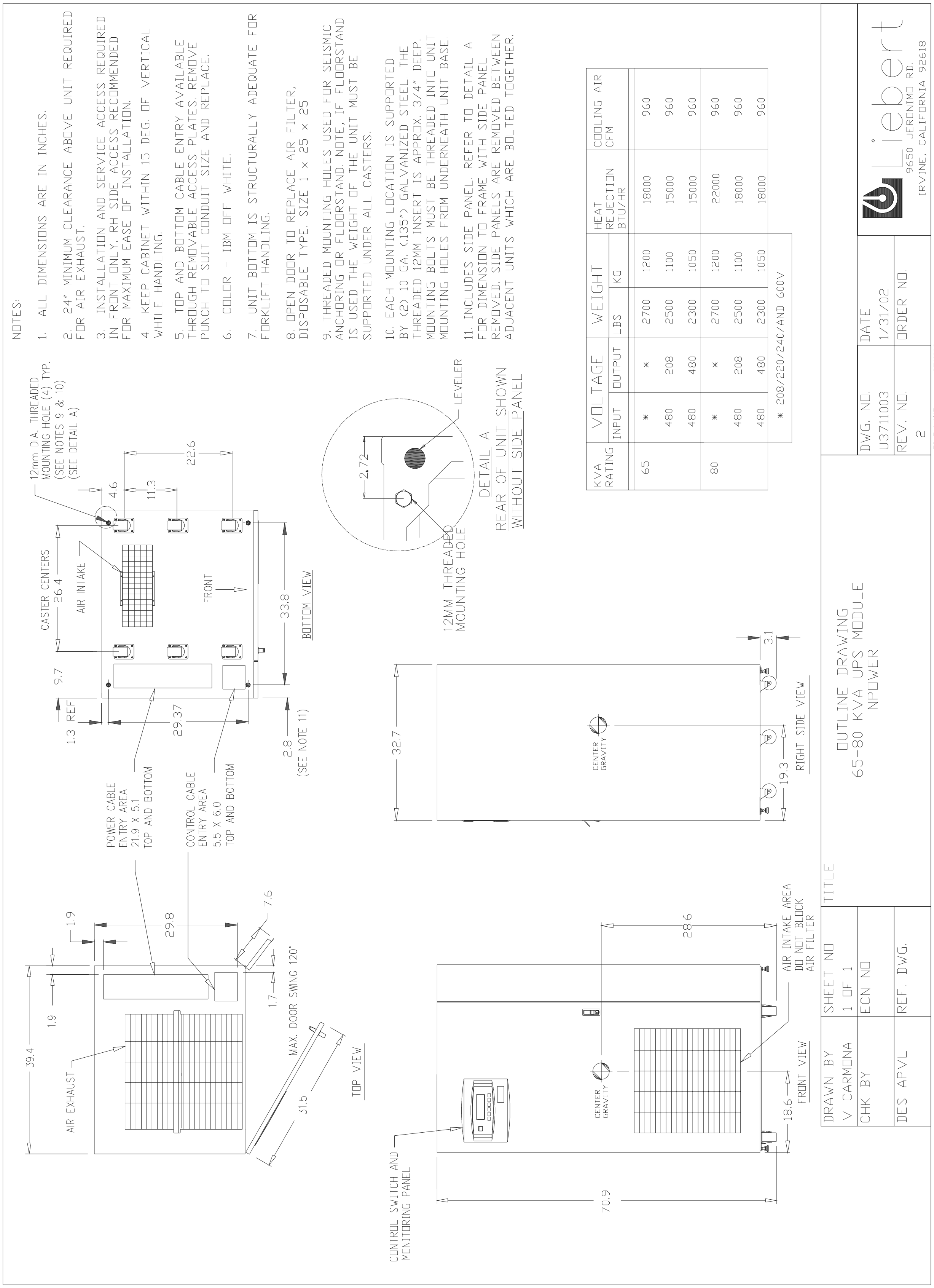


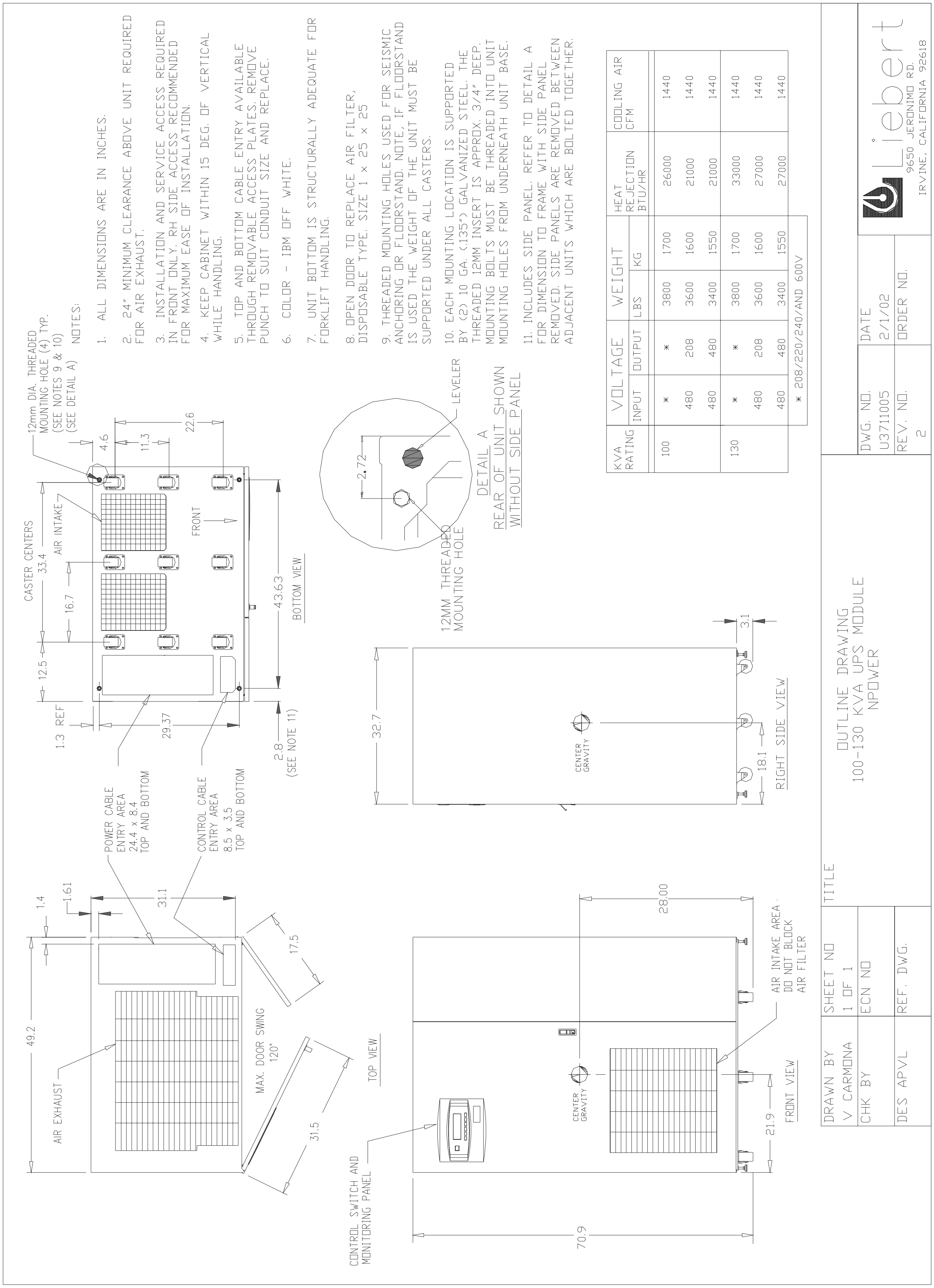
Figure 12 Outline Drawing, 65-80 kVA UPS



KVA RATING	VOLTAGE INPUT	VOLTAGE OUTPUT	WEIGHT LBS	WEIGHT KG	HEAT REJECTION BTU/HR	COOLING AIR CFM
65	*	*	2700	1200	18000	960
	480	208	2500	1100	15000	960
	480	480	2300	1050	15000	960
80	*	*	2700	1200	22000	960
	480	208	2500	1100	18000	960
	480	480	2300	1050	18000	960

* 208/220/240/AND 600V

Figure 13 Outline Drawing, 100-130 kVA UPS



KVA RATING	VOLTAGE INPUT	VOLTAGE OUTPUT	WEIGHT LBS	WEIGHT KG	HEAT REJECTION BTU/HR	COOLING AIR CFM
100	*	*	3800	1700	26000	1440
	480	208	3600	1600	21000	1440
	480	480	3400	1550	21000	1440
130	*	*	3800	1700	33000	1440
	480	208	3600	1600	27000	1440
	480	480	3400	1550	27000	1440

* 208/220/240/AND 600V

Figure 14 Outline Drawing, Battery Power Pack, 25-Inch Cabinet

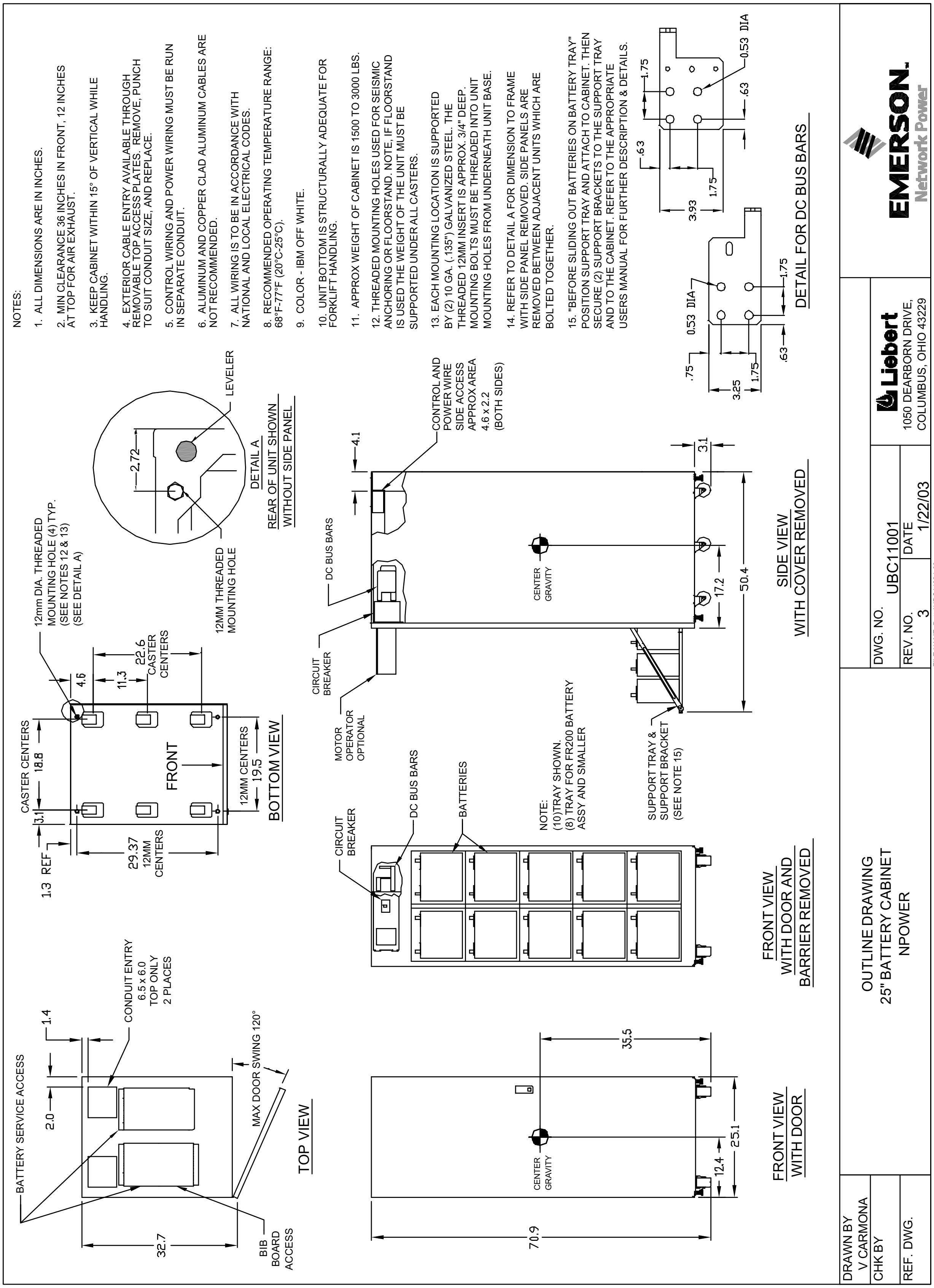


Figure 15 Outline Drawing, Battery Power Pack, 49-Inch Cabinet

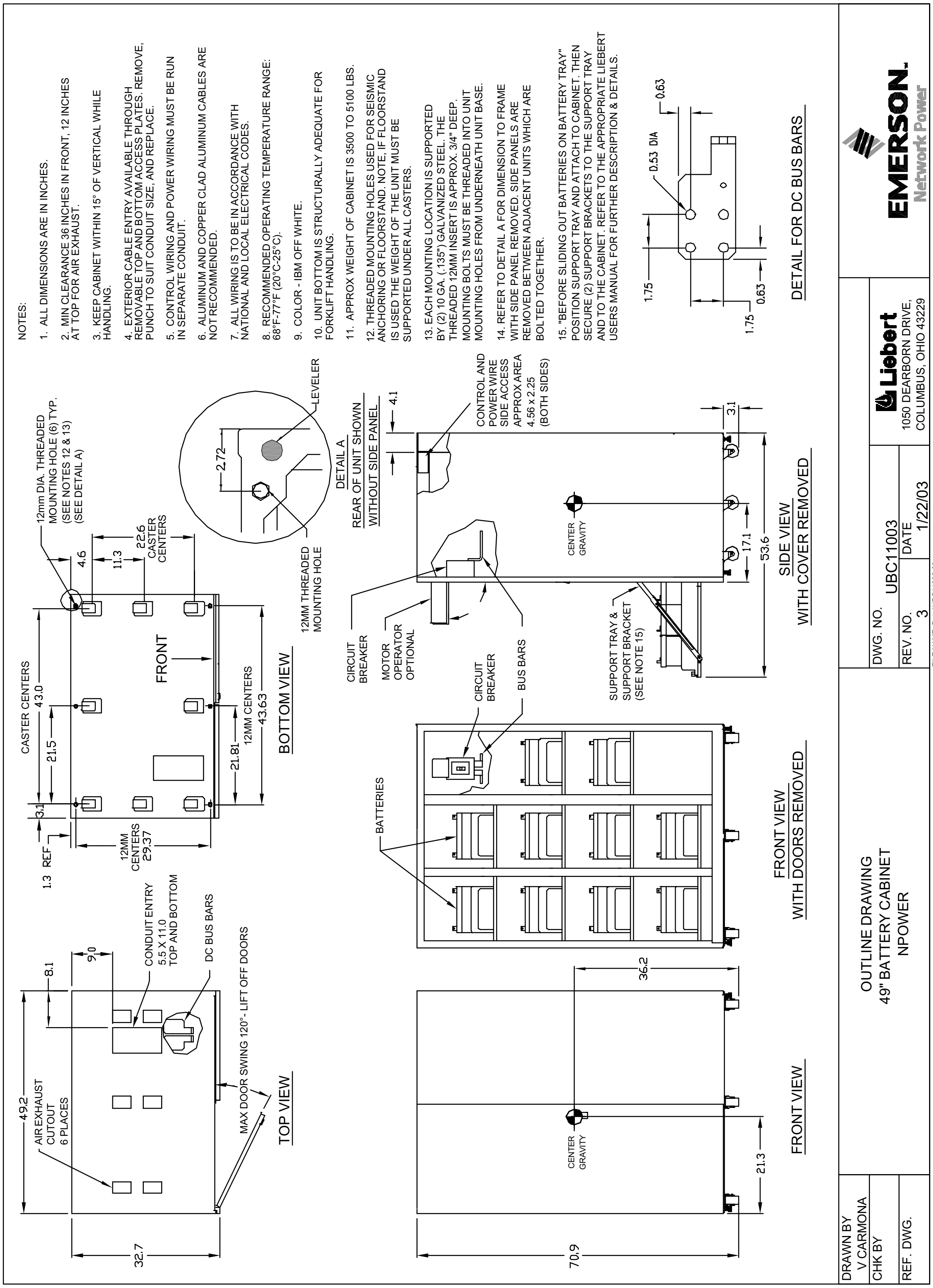


Figure 16 Outline Drawing, Maintenance Bypass Cabinet, "L" Configuration

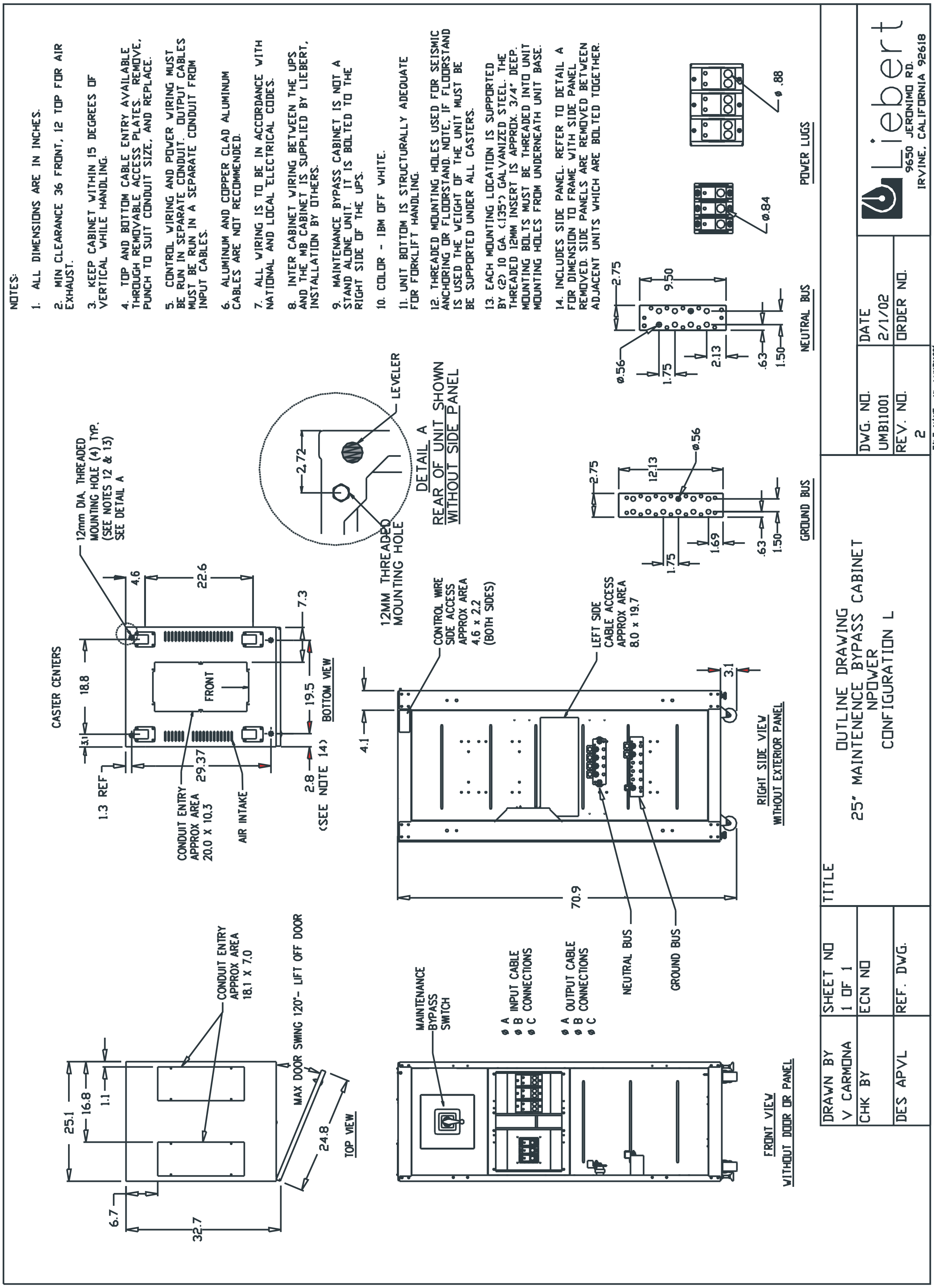


Figure 17 Outline Drawing, Maintenance Bypass Cabinet, “N” Configuration

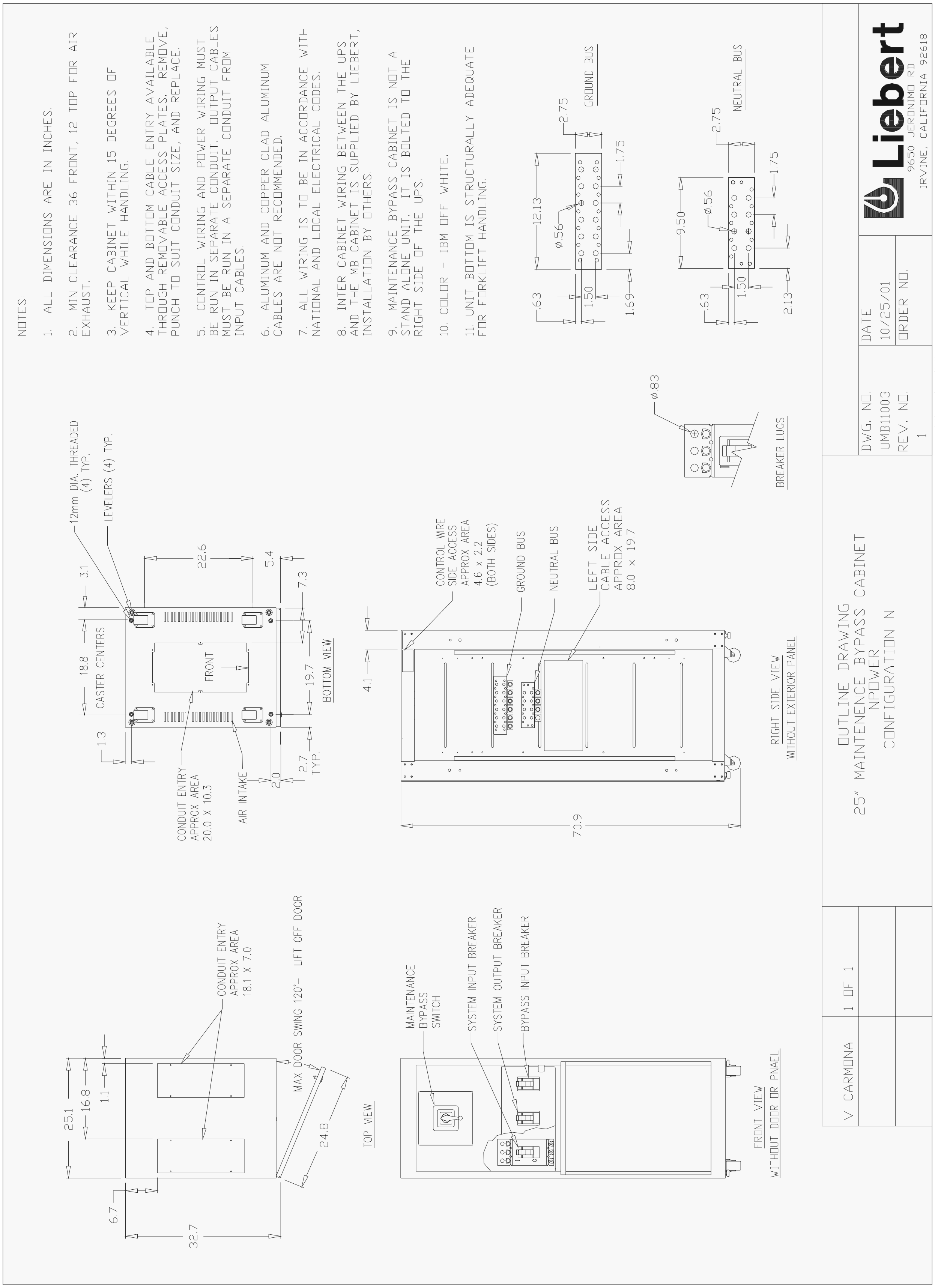


Figure 18 Outline Drawing, Maintenance Bypass Cabinet, “P” Configuration

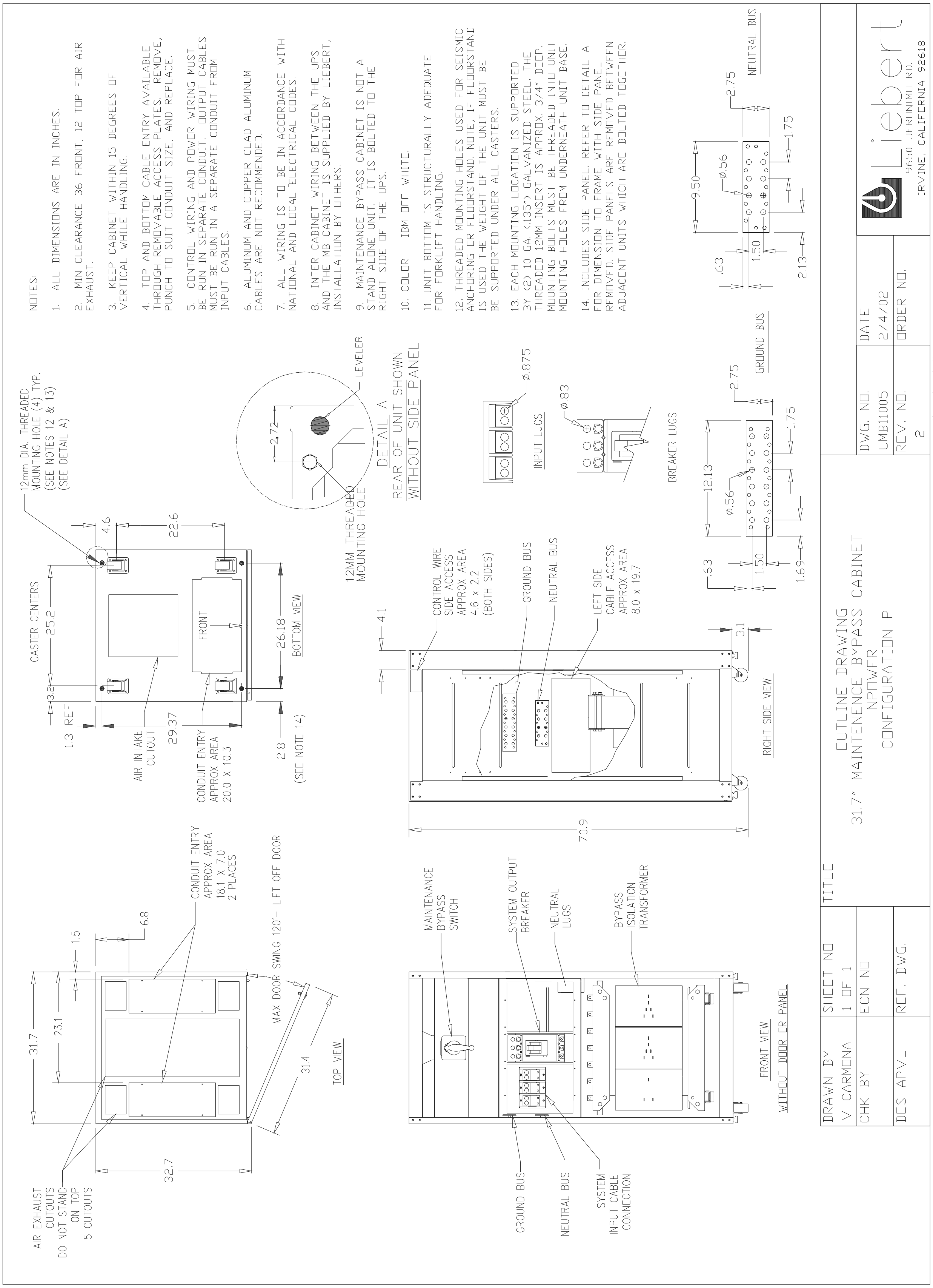


Figure 19 Outline Drawing, Maintenance Bypass Cabinet, “Q” Configuration

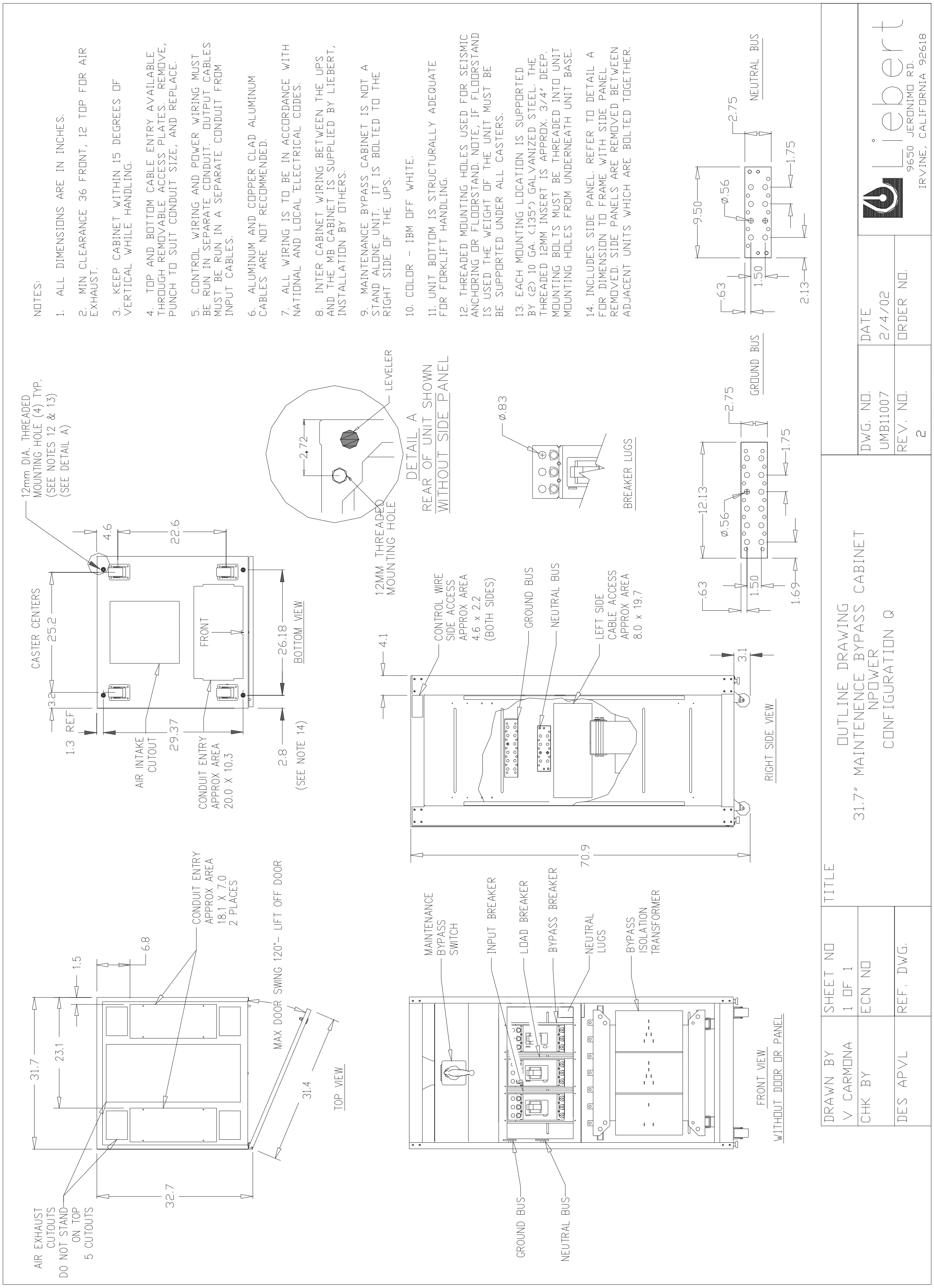


Figure 20 Outline Drawing, Slimline Distribution Cabinet, Top Cable Exit, Panelboards Only

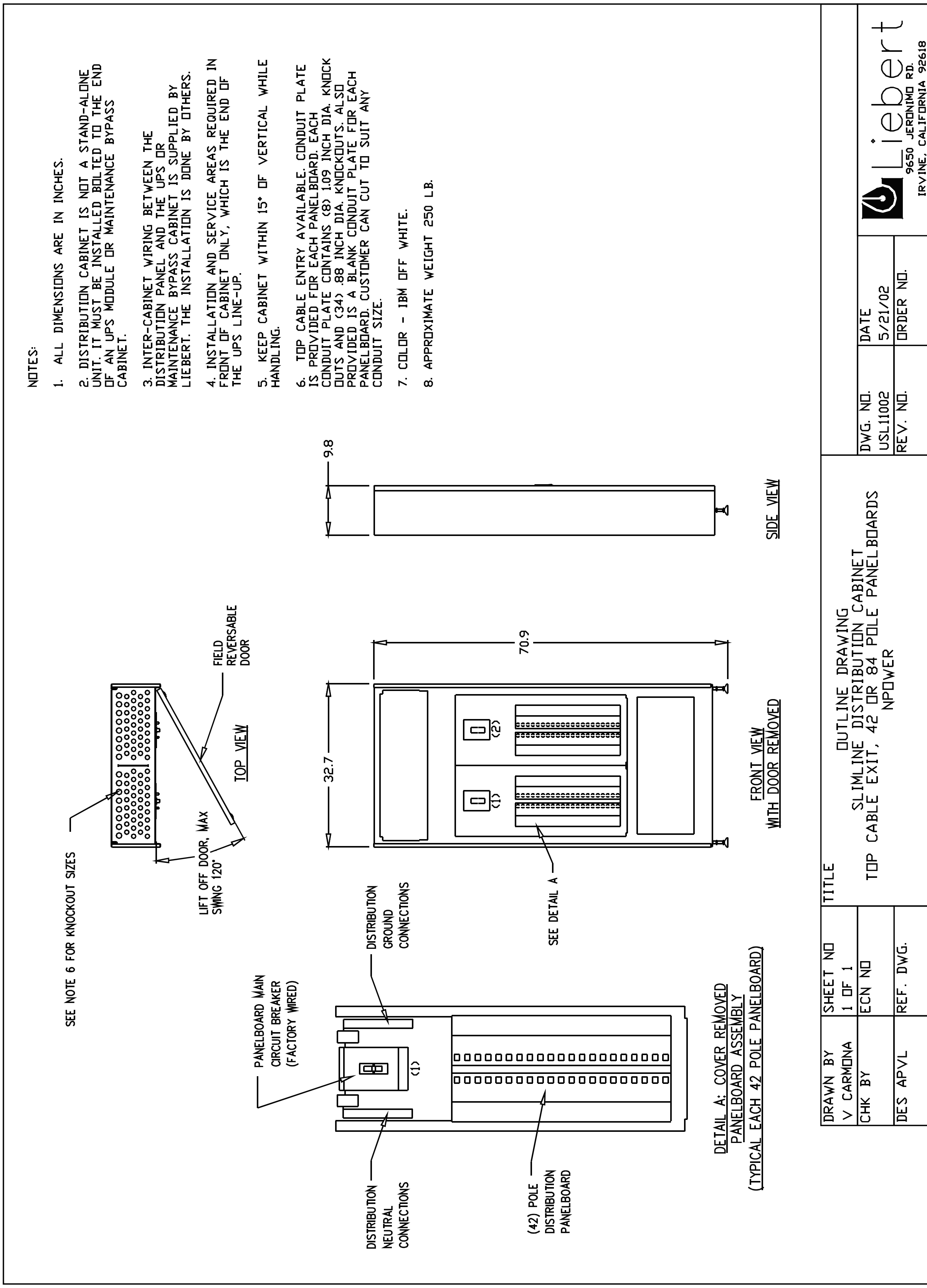


Figure 21 Outline Drawing, Slimline Distribution Cabinet, Bottom Cable Exit, Panelboards Only

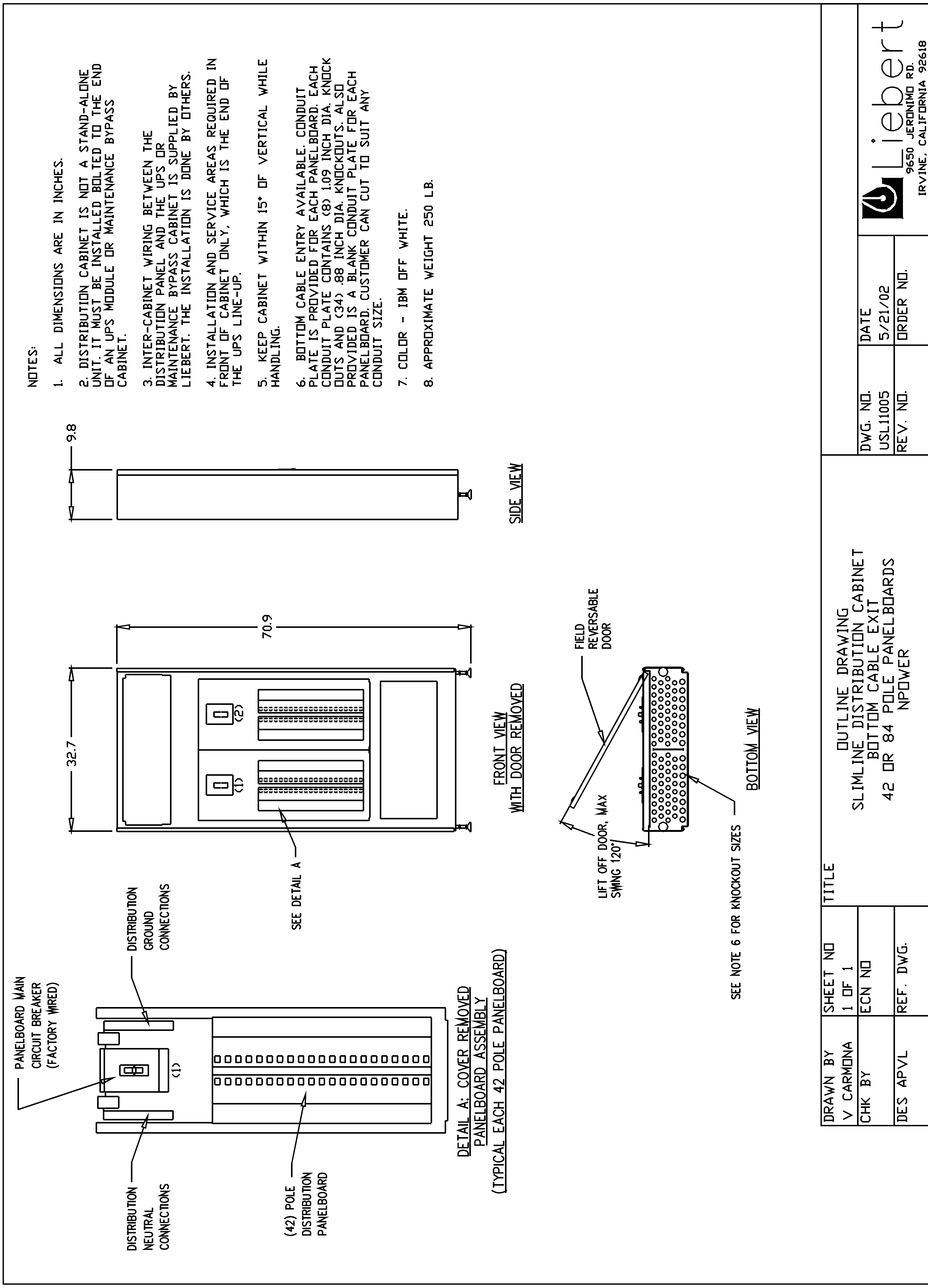


Figure 22 Outline Drawing, Slimline Distribution Cabinet, with Panelboard and Subfeed Breakers

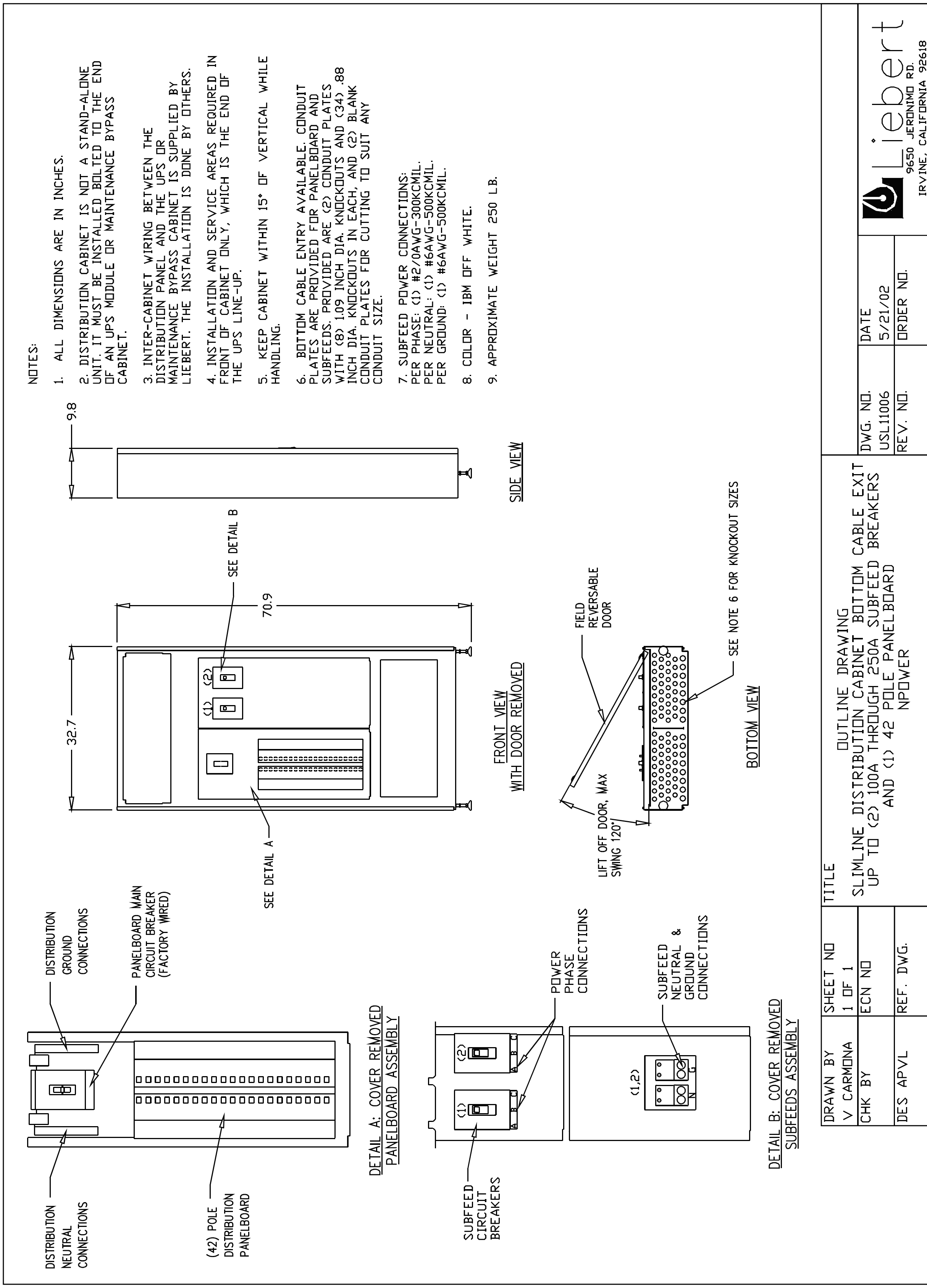


Figure 23 Outline Drawing, Slimline Distribution Cabinet, with 100-250A Subfeed Breakers Only

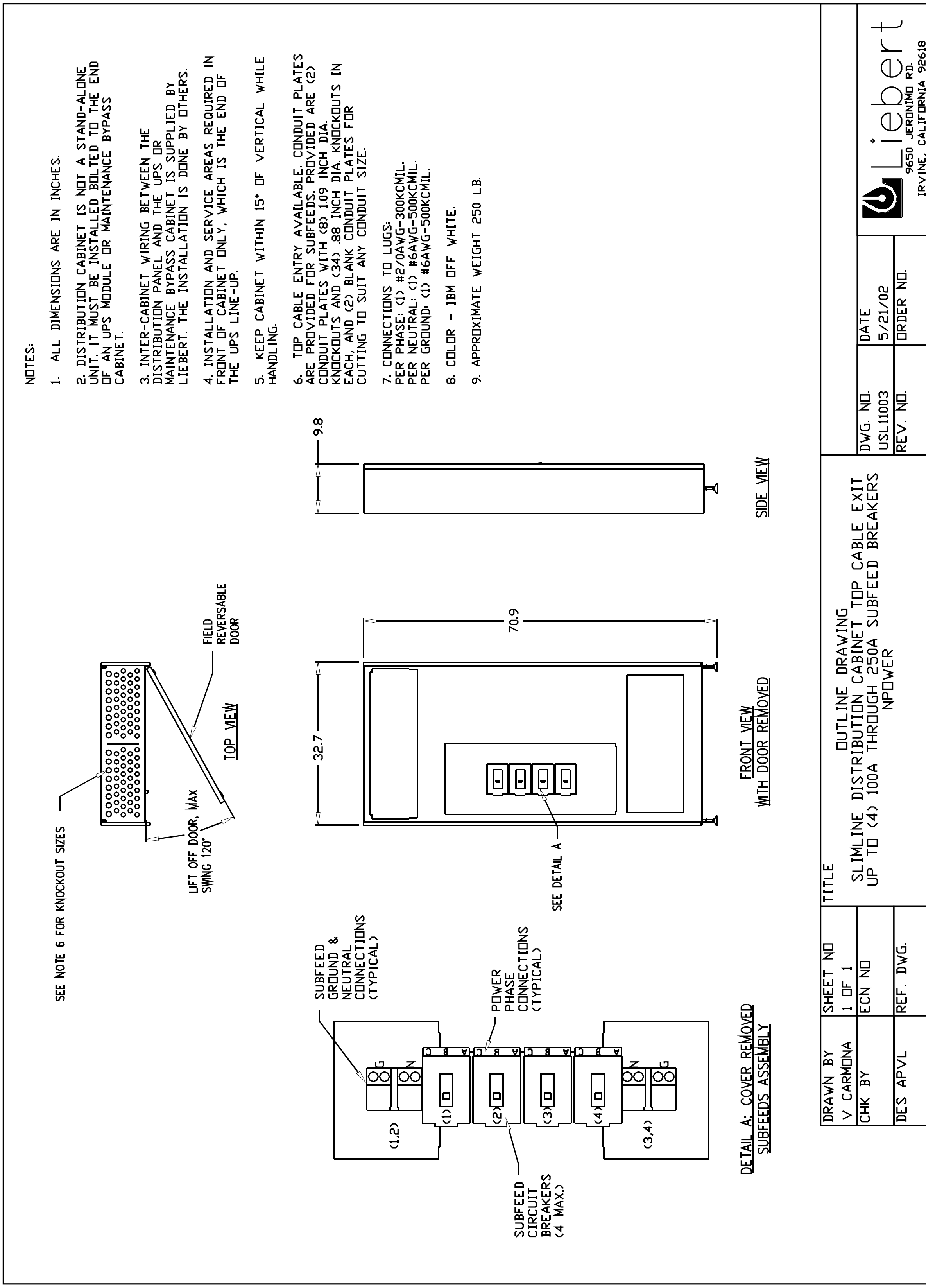


Figure 24 Outline Drawing, Slimline Distribution Cabinet, with 300-400A Subfeed Breakers Only

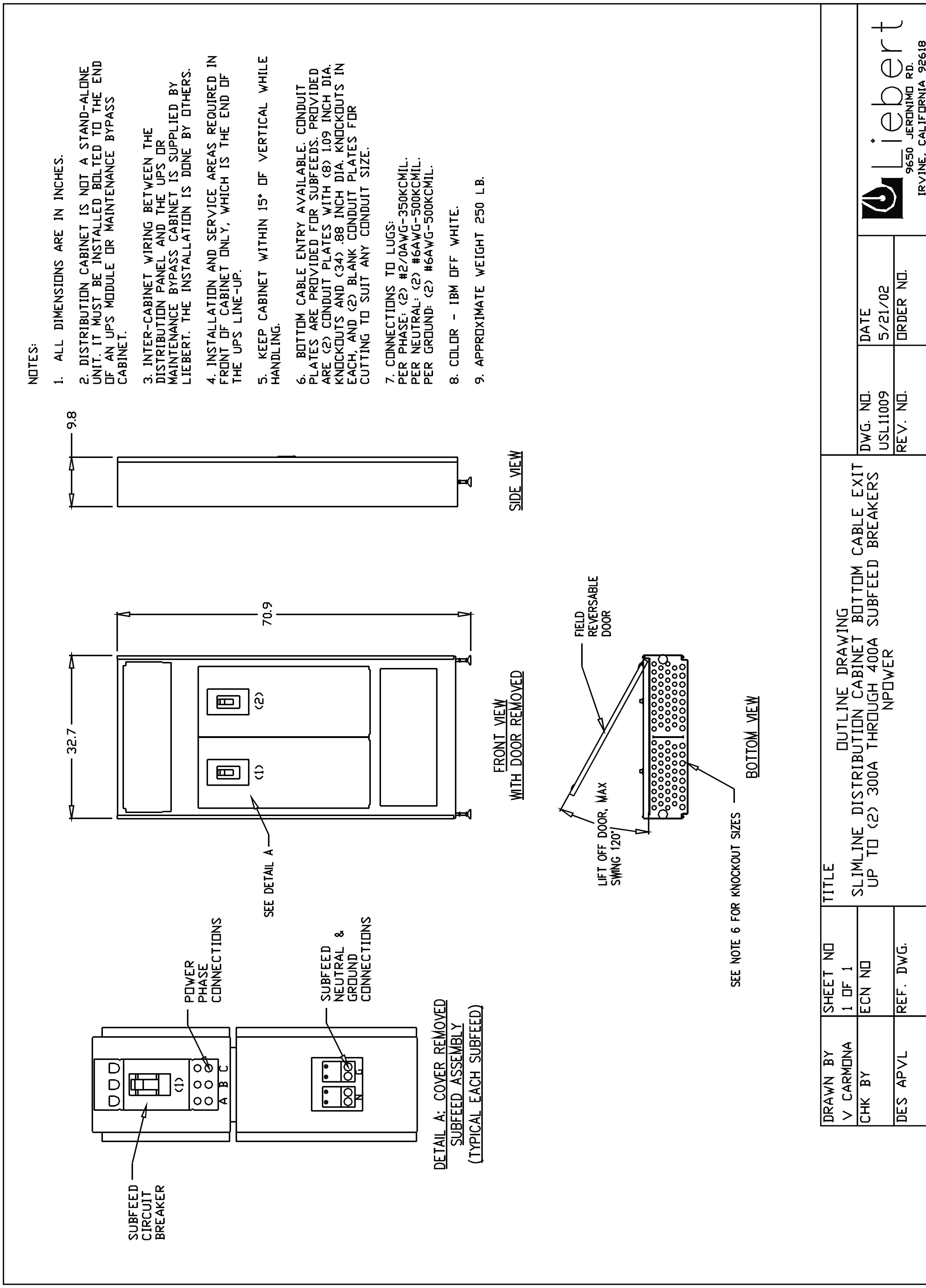


Figure 25 Specifications Table, 1+1 Paralleling Panelboard Configuration “N”

1+1 UPS RATING			"N" TYPE 3-BREAKER PANELBOARD					
KVA	OUTPUT VOLTAGE	CIRCUIT BREAKER AMPS	COMPONENT TYPE			WEIGHT (LBS)	PANEL SIZE	DRAWING NUMBER
			PANELBOARD	CIRCUIT BREAKER	INTERRUPT (AIC)			
30	208V	125	I-LINE	SQ-D "QD"	22	200	B	U3711009
	220V	100	NF	SQ-D 'EDB'	25	100	A	U3711008
	240V	100	NF	SQ-D 'EDB'	25	100	A	U3711008
	480V	50	NF	SQ-D 'EDB'	18	100	A	U3711008
	600V	50	I-LINE	SQ-D "FA"	14	200	B	U3711009
40	208V	150	I-LINE	SQ-D "QD"	22	200	B	U3711009
	220V	150	I-LINE	SQ-D "QD"	22	200	B	U3711009
	240V	125	I-LINE	SQ-D "QD"	22	200	B	U3711009
	480V	60	NF	SQ-D 'EDB'	18	100	A	U3711008
	600V	50	I-LINE	SQ-D "FA"	14	200	B	U3711009
50	208V	175	I-LINE	SQ-D "QD"	22	200	B	U3711009
	220V	175	I-LINE	SQ-D "QD"	22	200	B	U3711009
	240V	150	I-LINE	SQ-D "QD"	22	200	B	U3711009
	480V	80	NF	SQ-D 'EDB'	18	100	A	U3711008
	600V	60	NF	SQ-D "FA"	14	200	B	U3711009
65	208V	225	I-LINE	SQ-D "QD"	22	200	B	U3711009
	220V	225	I-LINE	SQ-D "QD"	22	200	B	U3711009
	240V	200	I-LINE	SQ-D "QD"	22	200	B	U3711009
	480V	100	NF	SQ-D 'EDB'	18	100	A	U3711008
	600V	80	I-LINE	SQ-D "FA"	14	200	B	U3711009
80	208V	300	I-LINE	SQ-D "LA"	25	400	C	U3711010
	220V	300	I-LINE	SQ-D "LA"	25	400	C	U3711010
	240V	250	I-LINE	SQ-D "KA"	25	250	B	U3711009
	480V	125	I-LINE	SQ-D "KA"	25	200	B	U3711009
	600V	100	I-LINE	SQ-D "FA"	14	200	B	U3711009
100	208V	350	I-LINE	SQ-D "LA"	25	400	C	U3711010
	220V	350	I-LINE	SQ-D "LA"	25	400	C	U3711010
	240V	300	I-LINE	SQ-D "LA"	25	400	C	U3711010
	480V	150	I-LINE	SQ-D "KA"	25	200	B	U3711009
	600V	125	I-LINE	SQ-D "KA"	22	200	B	U3711009
130	208V	450	I-LINE	SQ-D "LC"	42	450	C	U3711010
	220V	450	I-LINE	SQ-D "LC"	42	450	C	U3711010
	240V	400	I-LINE	SQ-D "LA"	25	400	C	U3711010
	480V	200	I-LINE	SQ-D "KA"	25	200	B	U3711009
	600V	175	I-LINE	SQ-D "KA"	22	200	B	U3711009

DRAWN BY M MIERSEN	OUTLINE DRAWING	DWG. NO. U3711007		
CHK BY	NPOWER 1+1	REV. NO.	DATE 6/17/03	Liebert 1050 DEARBORN DRIVE, COLUMBUS, OHIO 43229
REF. DWG.	SYSTEM PARALLELING PANELBOARD CONFIGURATION "N", COMMON INFORMATION			EMERSON. Network Power

FILE NAME: I/APPL/NPOWER/DRAWINGS/OUTLINES/1+1SPC/U3711007/(C)

Figure 26 Outline Drawing, 1+1 Paralleling Panelboard, Configuration “N,” Size “A”

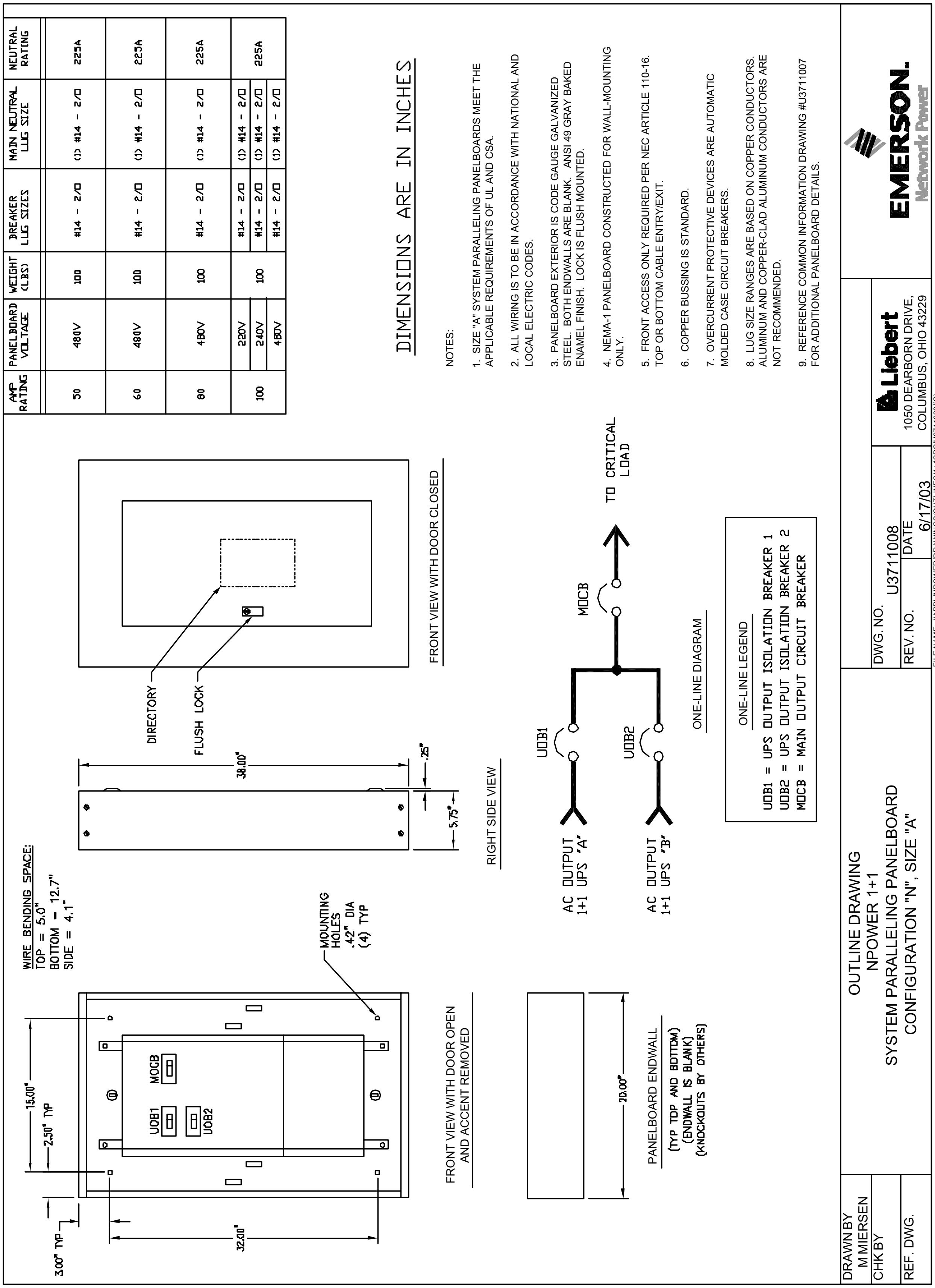
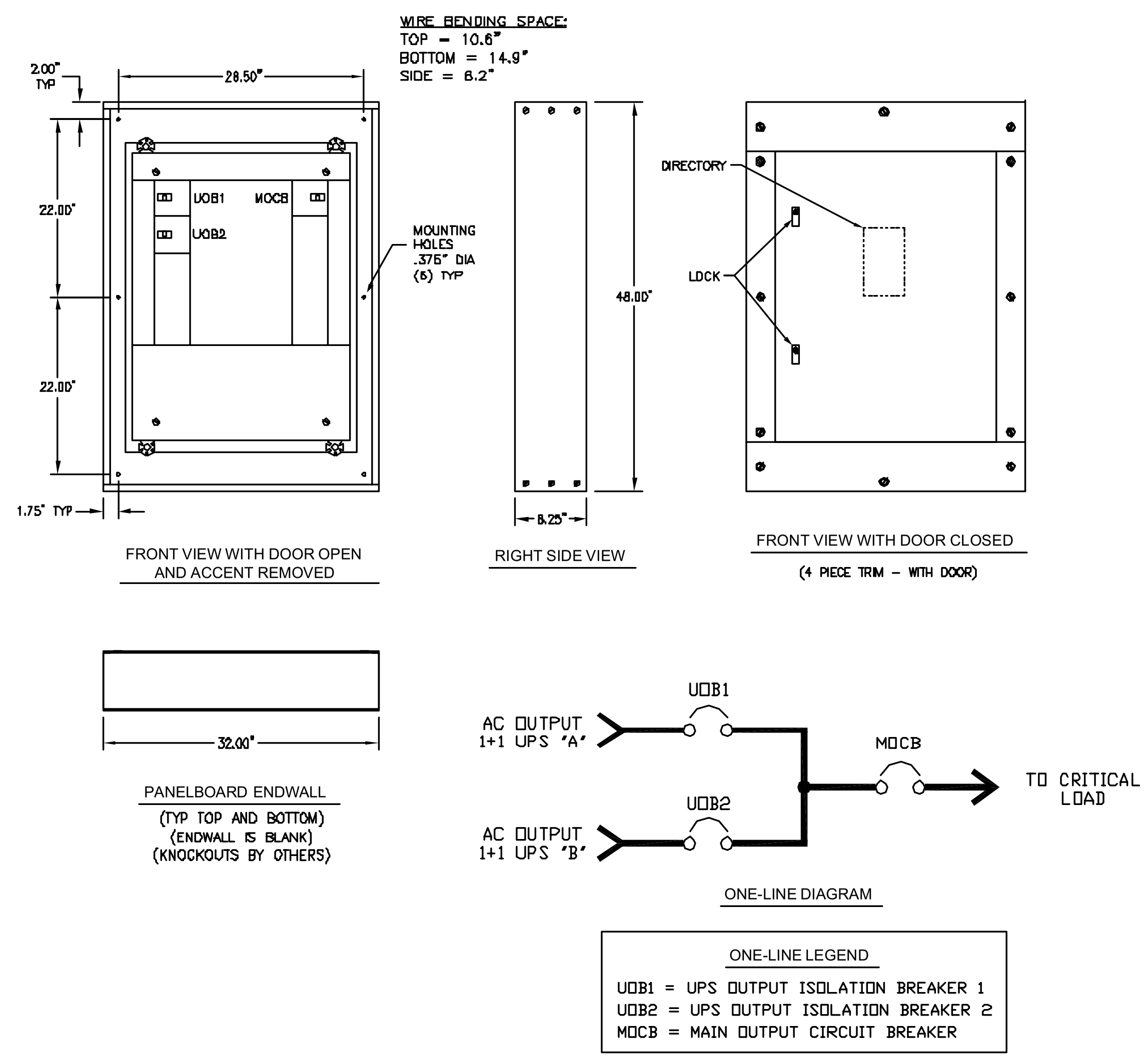


Figure 27 Outline Drawing, 1+1 Paralleling Panelboard, Configuration “N,” Size “B”



AMP RATING	PANELBOARD VOLTAGE	WEIGHT (LBS)	BREAKER LUG SIZES (SEE NOTE 7)	MAIN NEUTRAL LUG SIZE (SEE NOTE 7)	NEUTRAL RATING
50 TO 100	600V	200	#14-1/0	(2) #6-300kcml	225A
125	208V	200	#4-300kcml	(2) #4-600kcml	400A
	240V		#4-300kcml	(2) #4-600kcml	
	480V		#4-350kcmil	(2) #4-600kcml	
	600V		#4-350kcmil	(2) #4-600kcml	
150	208V	200	#4-300kcml	(2) #4-600kcml	400A
	220V		#4-300kcml	(2) #4-600kcml	
	240V		#4-300kcml	(2) #4-600kcml	
	480V		#4-350kcmil	(2) #4-600kcml	
175	208V	200	#4-300kcml	(2) #4-600kcml	400A
	220V		#4-300kcml	(2) #4-600kcml	
	600V		#4-350kcmil	(2) #4-600kcml	
200	240V	200	#4-300kcml	(2) #4-600kcml	400A
	480V		#4-350kcmil	(2) #4-600kcml	
225	208V	200	#4-300kcml	(2) #4-600kcml	400A
	220V		#4-300kcml	(2) #4-600kcml	
250	240V	250	#4-350kcmil	(2) #4-600kcml	600A

DIMENSIONS ARE IN INCHES

NOTES:

1. SIZE "B" SYSTEM PARALLELING PANELBOARDS ARE UL AND CSA LISTED.

2. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRIC CODES.

3. PANELBOARD EXTERIOR IS CODE GAUGE GALVANIZED STEEL. BOTH ENDWALLS ARE BLANK. ANSI 49 GRAY BAKED ENAMEL FINISH. (2) FLUSH MOUNTED LOCKS.

4. NEMA-1 PANELBOARD CONSTRUCTED FOR WALL-MOUNTING ONLY.

5. FRONT ACCESS ONLY REQUIRED PER NEC ARTICLE 110-16. TOP OR BOTTOM CABLE ENTRY/EXIT.

6. COPPER BUSSING IS STANDARD.

7. OVERCURRENT PROTECTION DEVICES ARE AUTOMATIC MOLDED CASE CIRCUIT BREAKERS.

8. LUG SIZE RANGES ARE BASED ON COPPER CONDUCTORS. ALUMINUM AND COPPER-CLAD ALUMINUM CONDUCTORS ARE NOT RECOMMENDED.

9. REFERENCE COMMON INFORMATION DRAWING #U3711007 FOR ADDITIONAL PANELBOARD DETAILS.

DRAWN BY M MIERSEN
CHK BY
REF. DWG.

OUTLINE DRAWING
NPOWER 1+1
SYSTEM PARALLELING PANELBOARD
CONFIGURATION "N", SIZE "B"

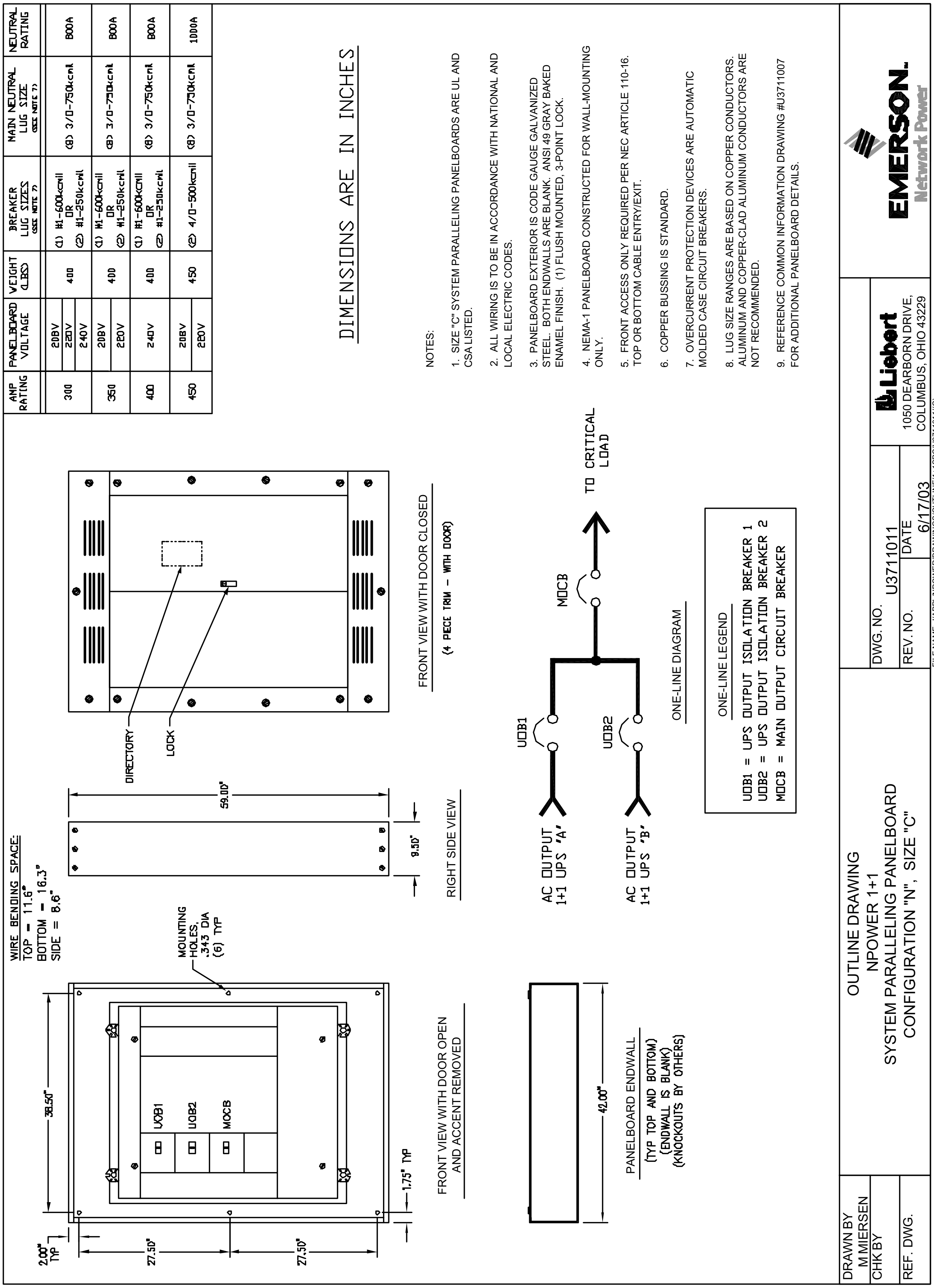
DWG. NO. U3711009
REV. NO.
DATE 6/17/03

Liebert
1050 DEARBORN DRIVE,
COLUMBUS, OHIO 43229

EMERSON. Network Power

FILE NAME: I/APPL/NPOWER/DRAWINGS/OUTLINES/1+1SPC/U3711009/(C)

Figure 28 Outline Drawing, 1+1 Paralleling Panelboard, Configuration “N,” Size “C”



AMP RATING	PANELBOARD VOLTAGE	WEIGHT (LBS)	BREAKER LUG SIZES (SEE NOTE 7)	MAIN NEUTRAL LUG SIZE (SEE NOTE 7)	NEUTRAL RATING
300	208V 220V 240V	400	(1) #1-600kcmil OR (2) #1-250kcmil	(8) 3/0-750kcmil	800A
350	208V 220V	400	(1) #1-600kcmil OR (2) #1-250kcmil	(8) 3/0-750kcmil	800A
400	240V	400	(1) #1-600kcmil OR (2) #1-250kcmil	(8) 3/0-750kcmil	800A
450	208V 220V	450	(2) 4/0-500kcmil	(8) 3/0-750kcmil	1000A

NOTES:

1. SIZE "C" SYSTEM PARALLELING PANELBOARDS ARE UL AND CSA LISTED.
2. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRIC CODES.
3. PANELBOARD EXTERIOR IS CODE GAUGE GALVANIZED STEEL. BOTH ENDWALLS ARE BLANK. ANSI 49 GRAY BAKED ENAMEL FINISH. (1) FLUSH MOUNTED, 3-POINT LOCK.
4. NEMA-1 PANELBOARD CONSTRUCTED FOR WALL-MOUNTING ONLY.
5. FRONT ACCESS ONLY REQUIRED PER NEC ARTICLE 110-16. TOP OR BOTTOM CABLE ENTRY/EXIT.
6. COPPER BUSSING IS STANDARD.
7. OVERCURRENT PROTECTION DEVICES ARE AUTOMATIC MOLDED CASE CIRCUIT BREAKERS.
8. LUG SIZE RANGES ARE BASED ON COPPER CONDUCTORS. ALUMINUM AND COPPER-CLAD ALUMINUM CONDUCTORS ARE NOT RECOMMENDED.
9. REFERENCE COMMON INFORMATION DRAWING #U3711007 FOR ADDITIONAL PANELBOARD DETAILS.

Figure 29 Outline Drawing, Seismic Anchoring, 30-50 kVA UPS

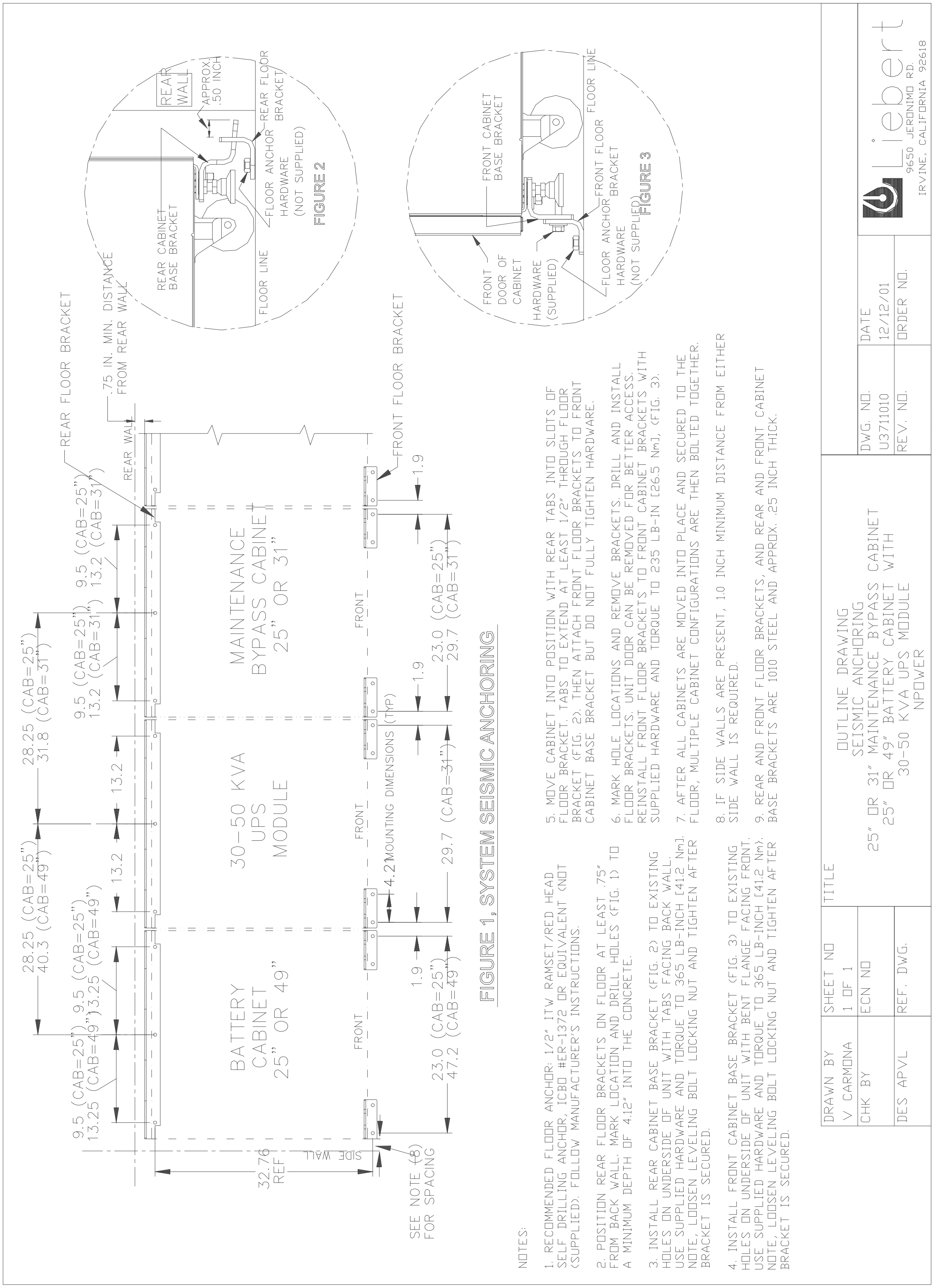


Figure 30 Outline Drawing, Seismic Anchoring, 65-80 kVA UPS

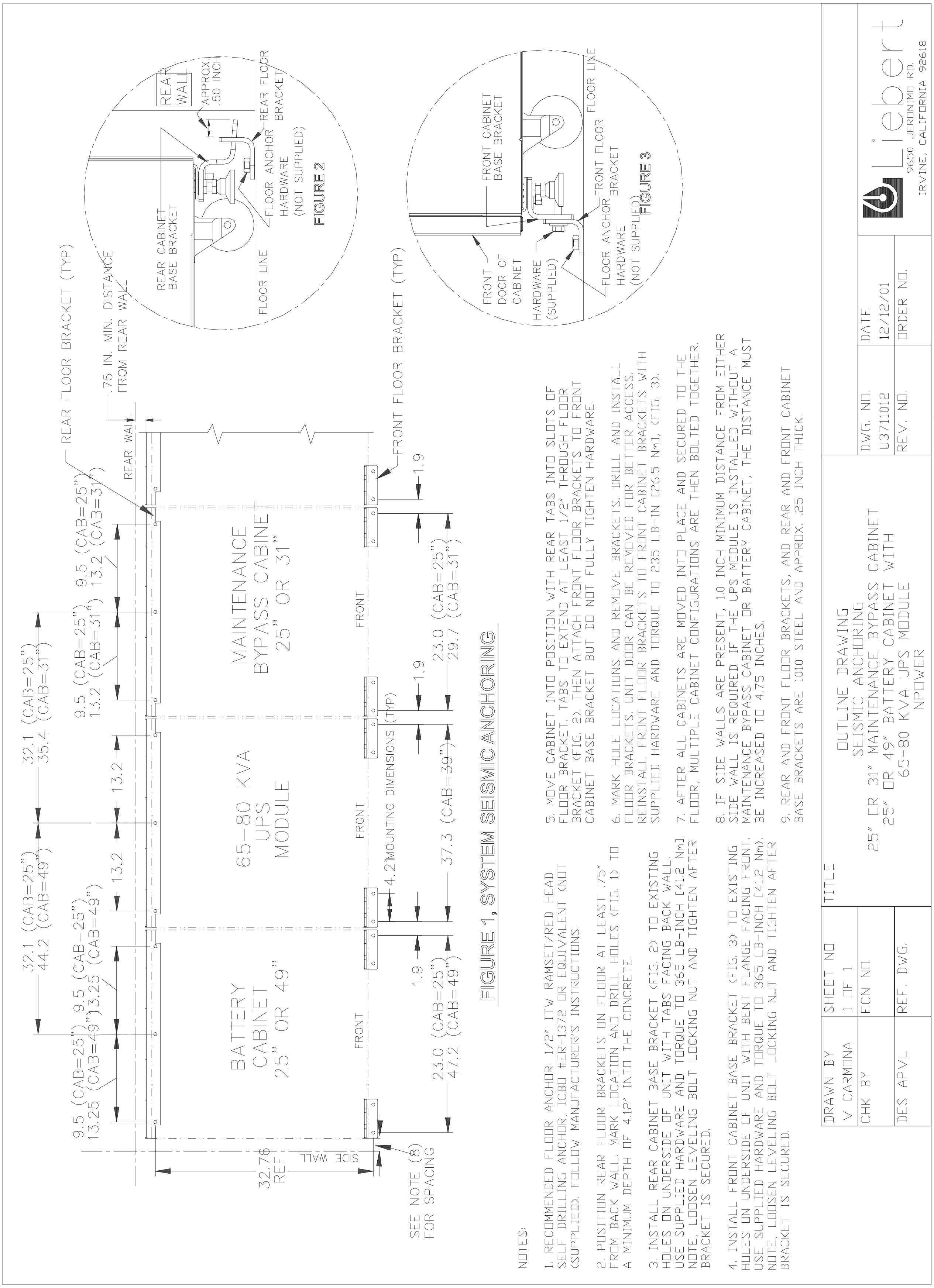


Figure 31 Outline Drawing, Seismic Anchoring, 100-130 kVA UPS

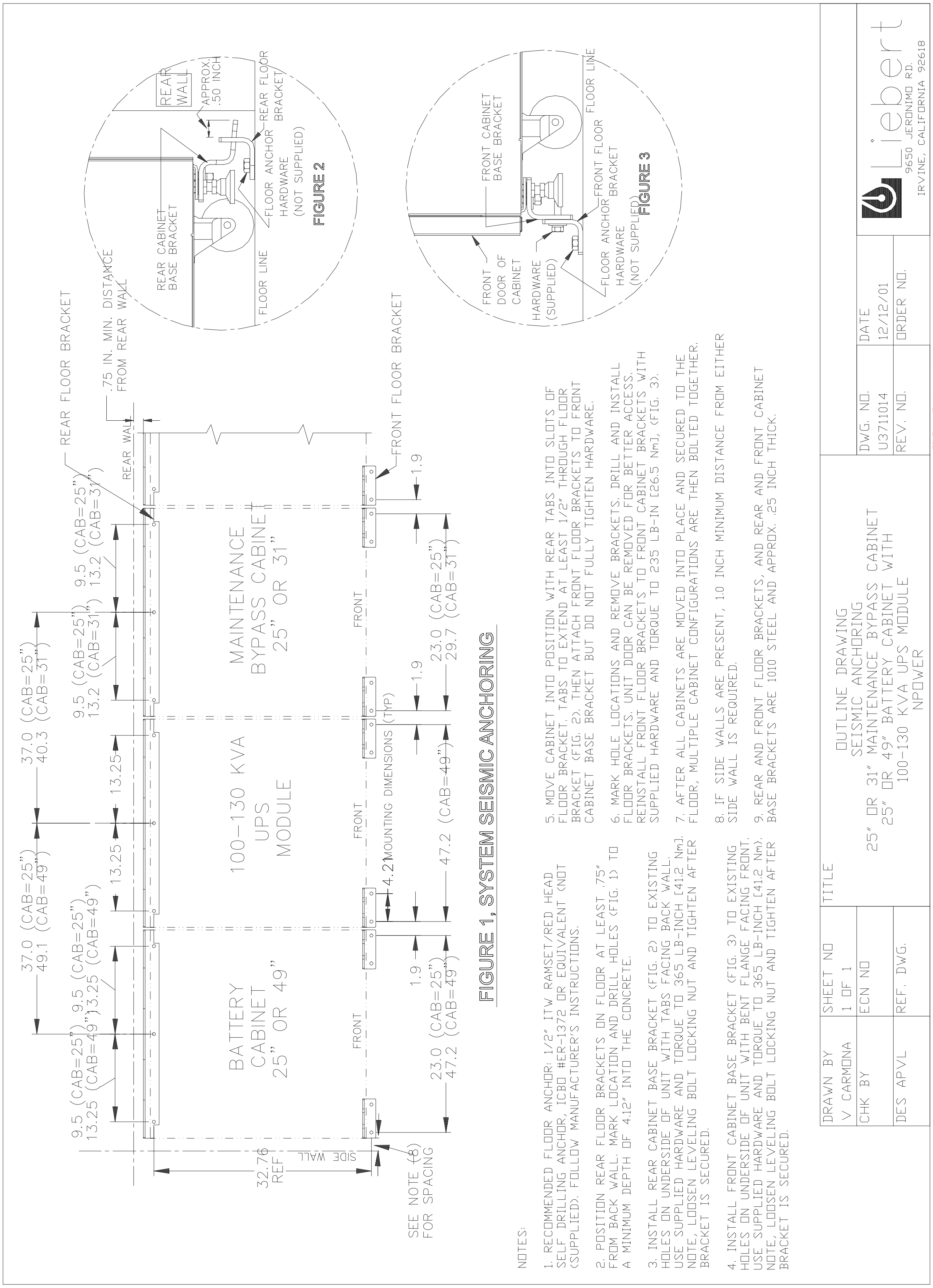


Figure 32 Outline Drawing, Remote Battery Breaker 30 - 130 kVA

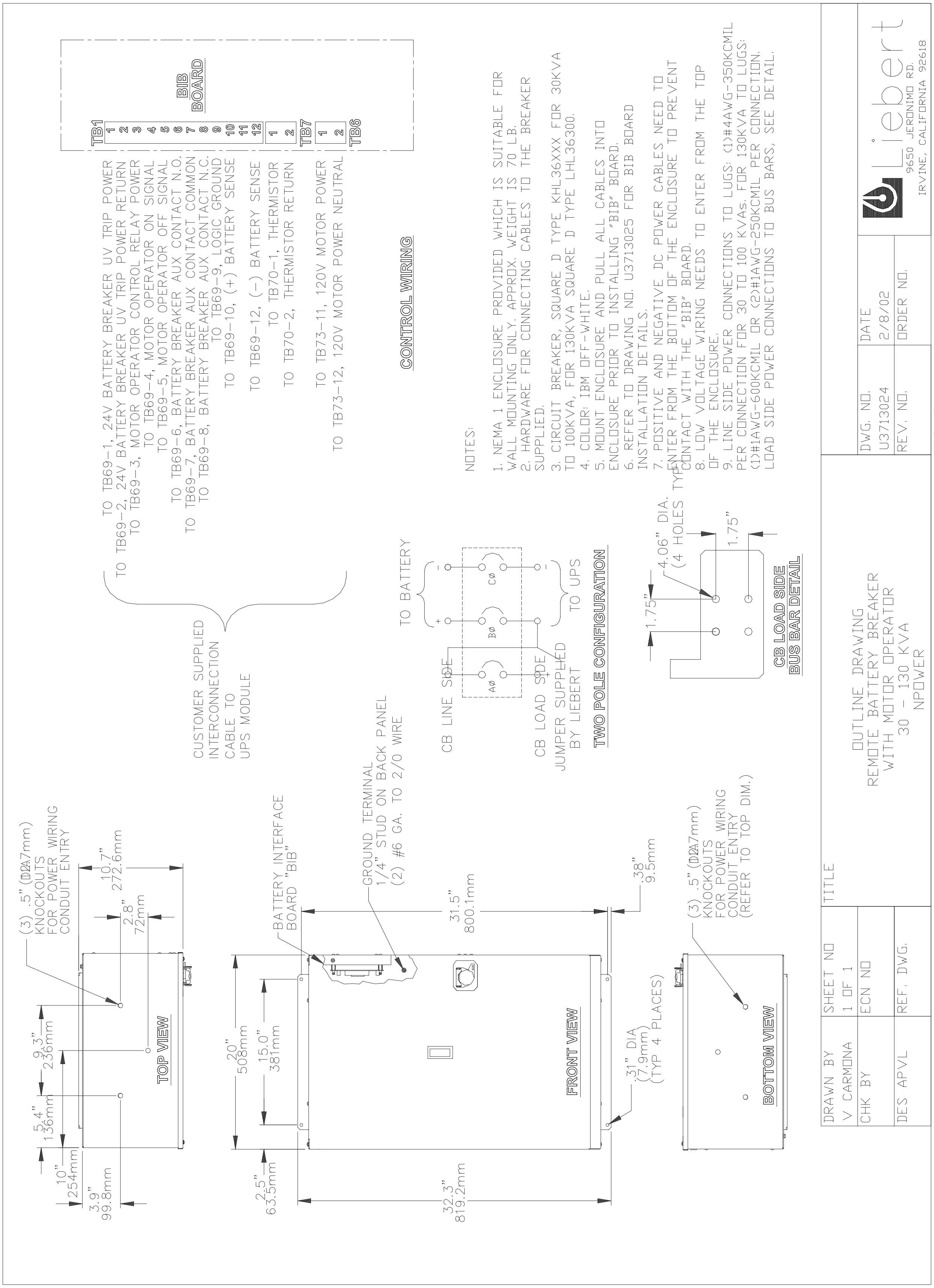


Figure 33 Outline Drawing, Remote Battery Breaker with Motor Operator, 30 - 130 kVA

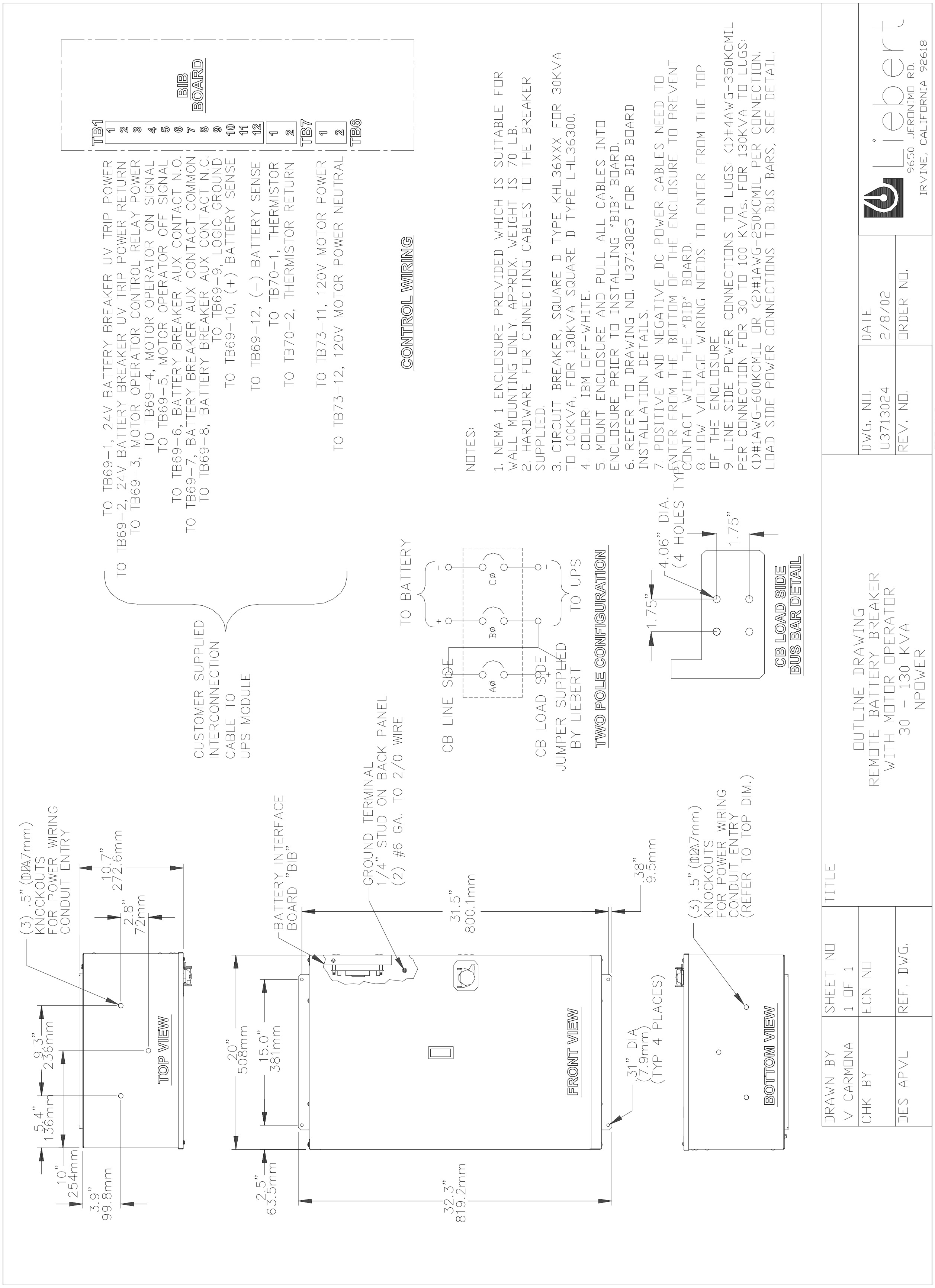


Figure 34 Outline Drawing, Remote Battery Breaker with BIB Installed

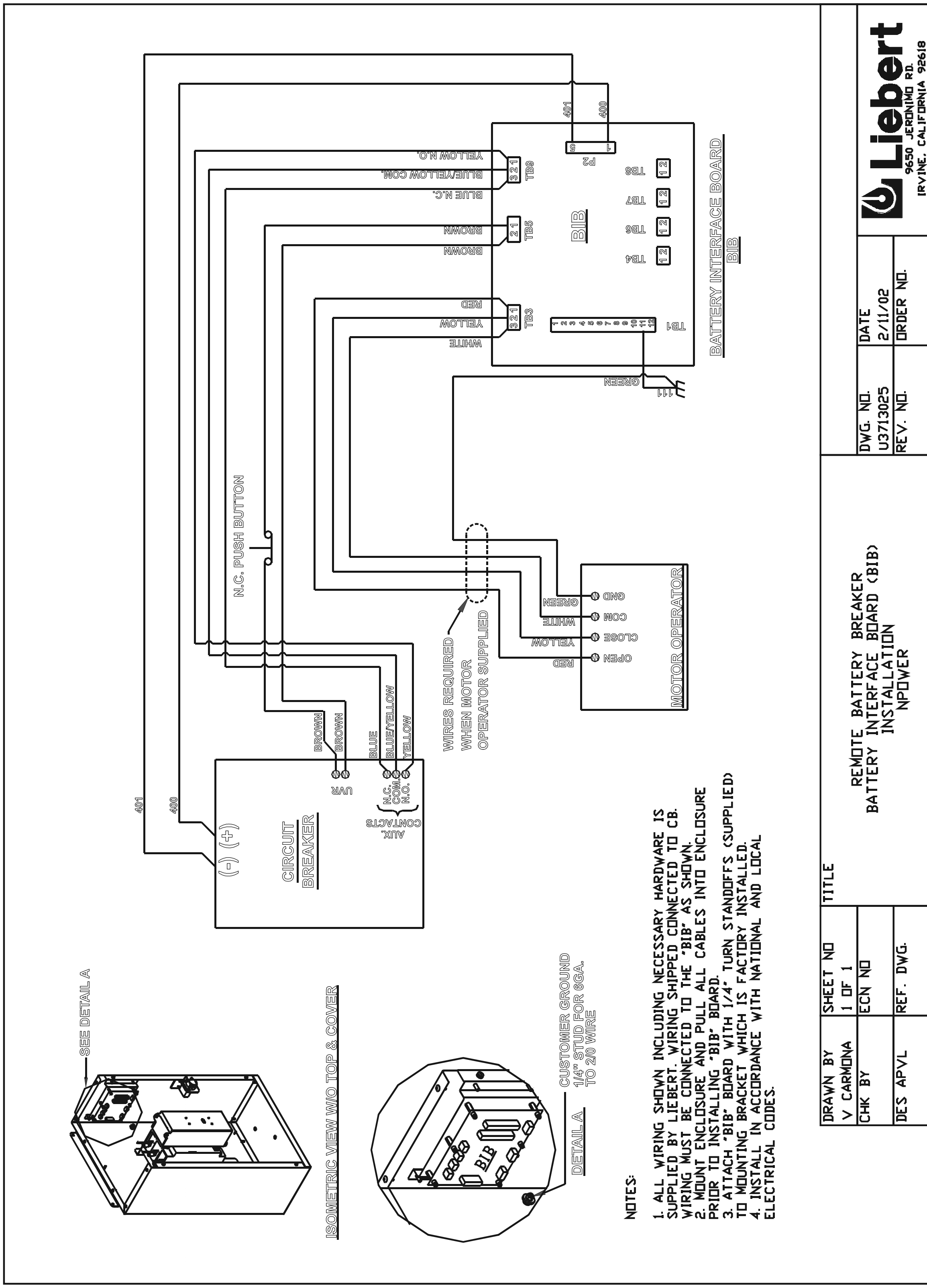


Figure 35 Outline Drawing, Remote Alarm Status Panel

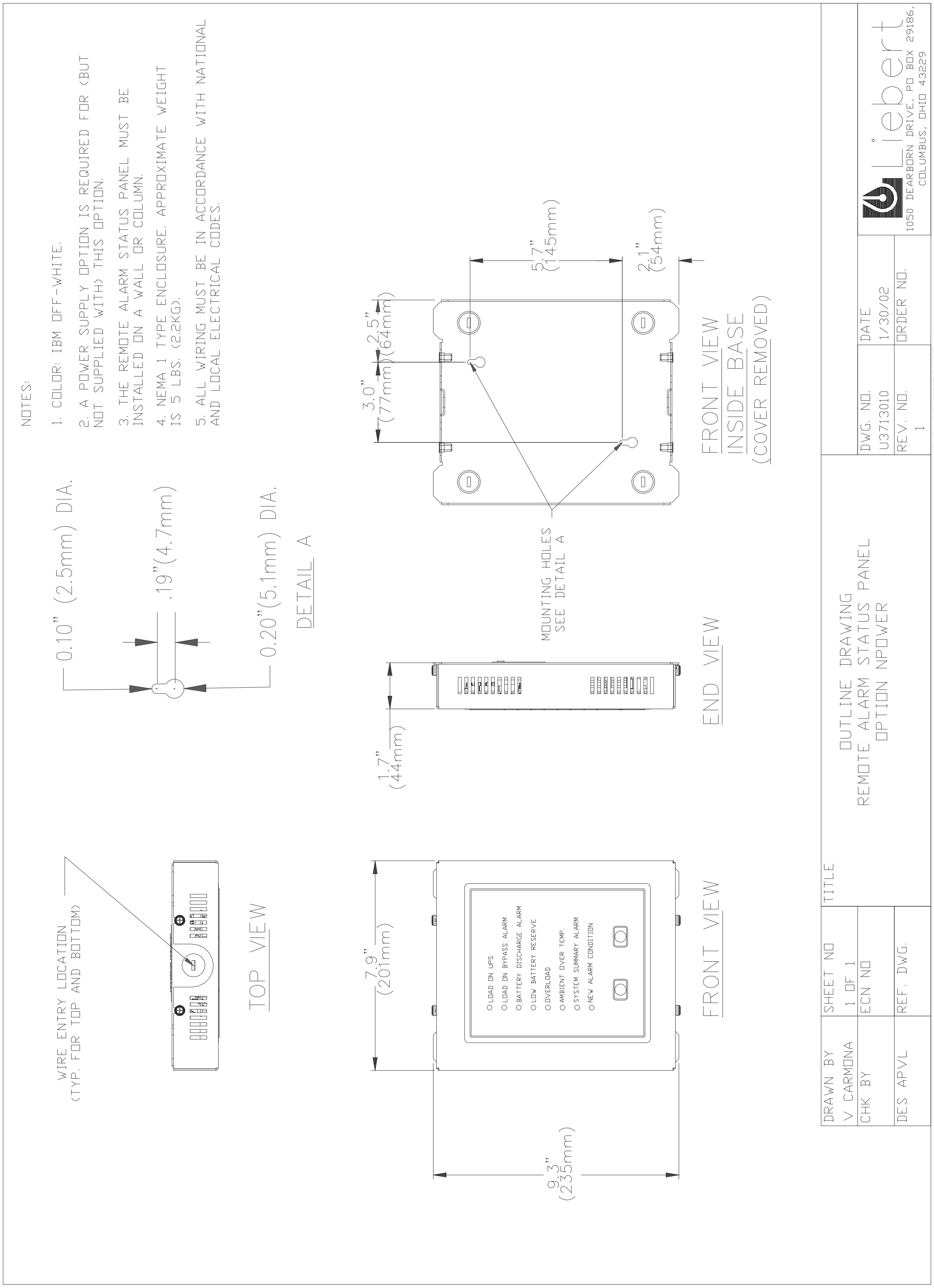


Figure 36 Outline Drawing, LBS Control Panel

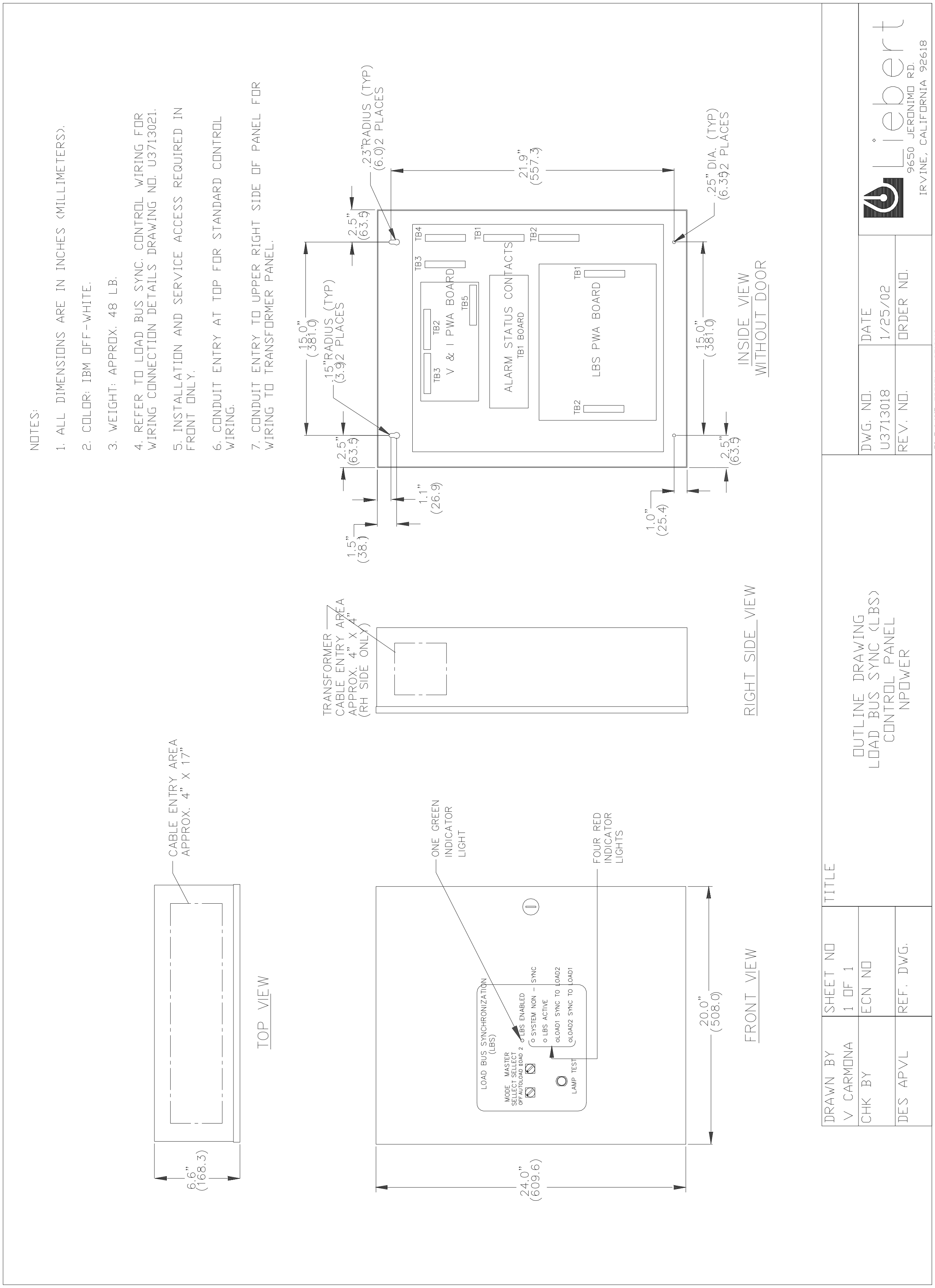


Figure 37 Outline Drawing, LBS Alarm Status Contacts

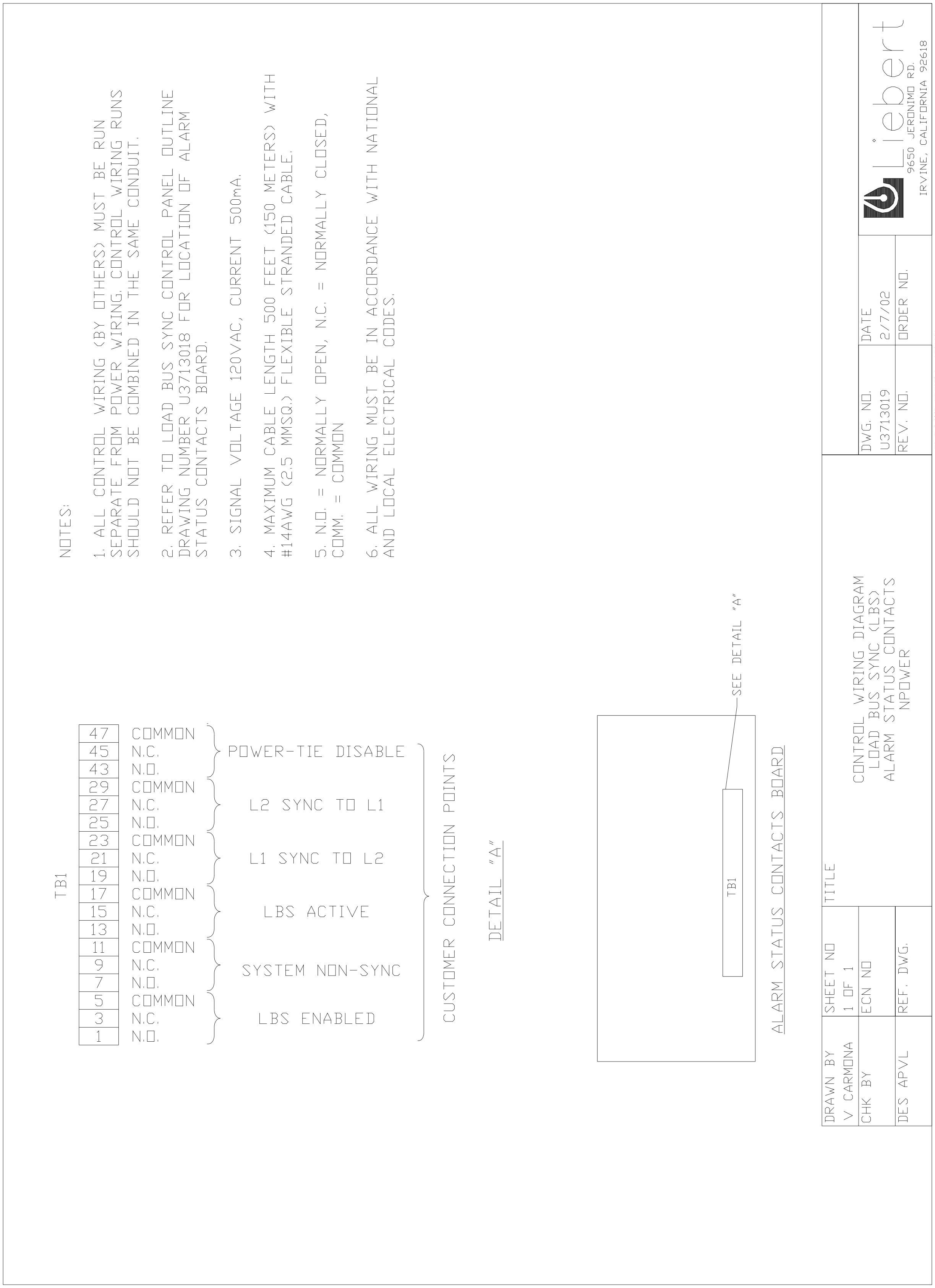


Figure 38 Outline Drawing, LBS Transformer Panel

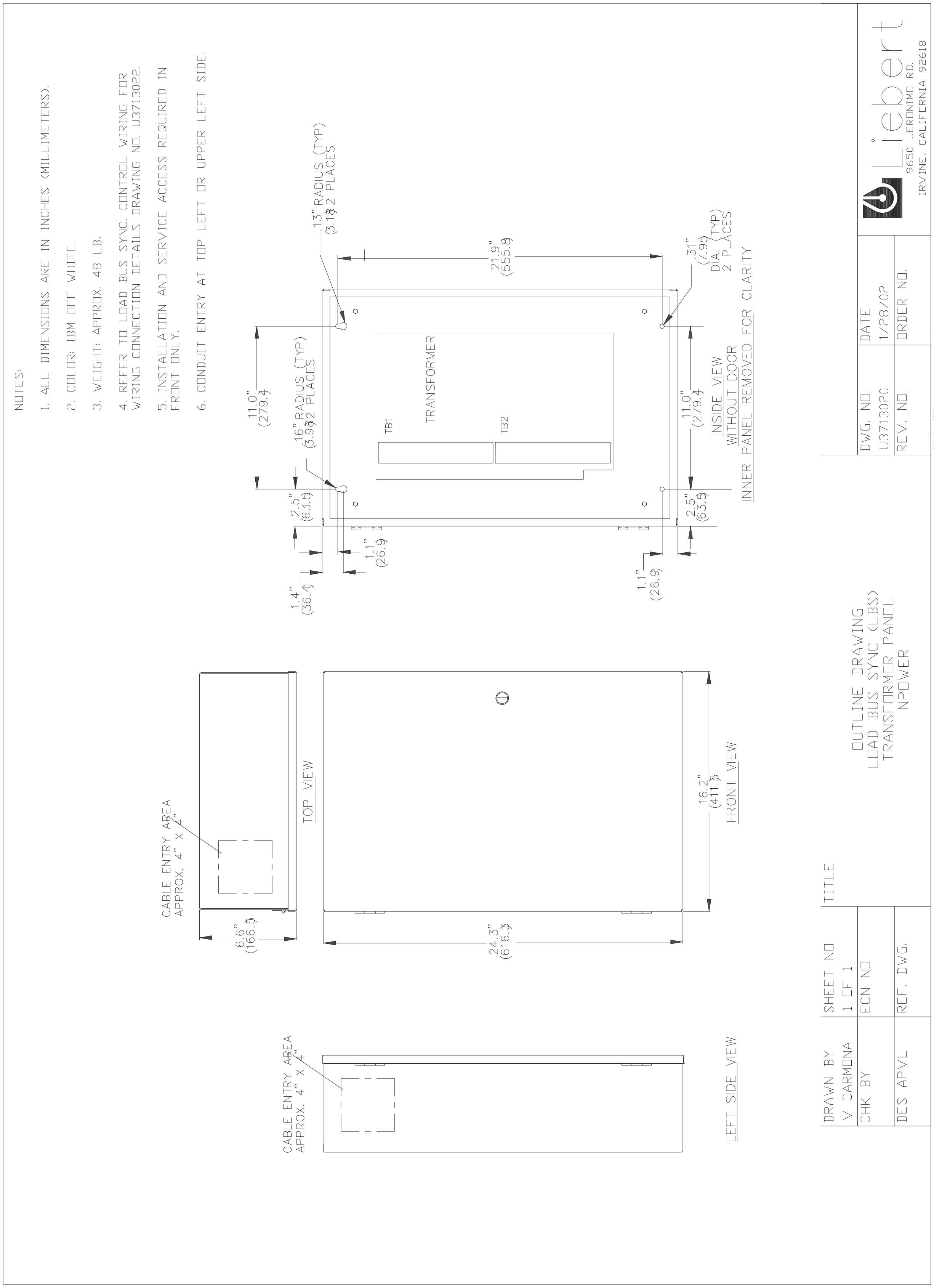


Figure 39 Control Wiring, LBS Interconnection Wiring Diagram for Configs A, B, R, S

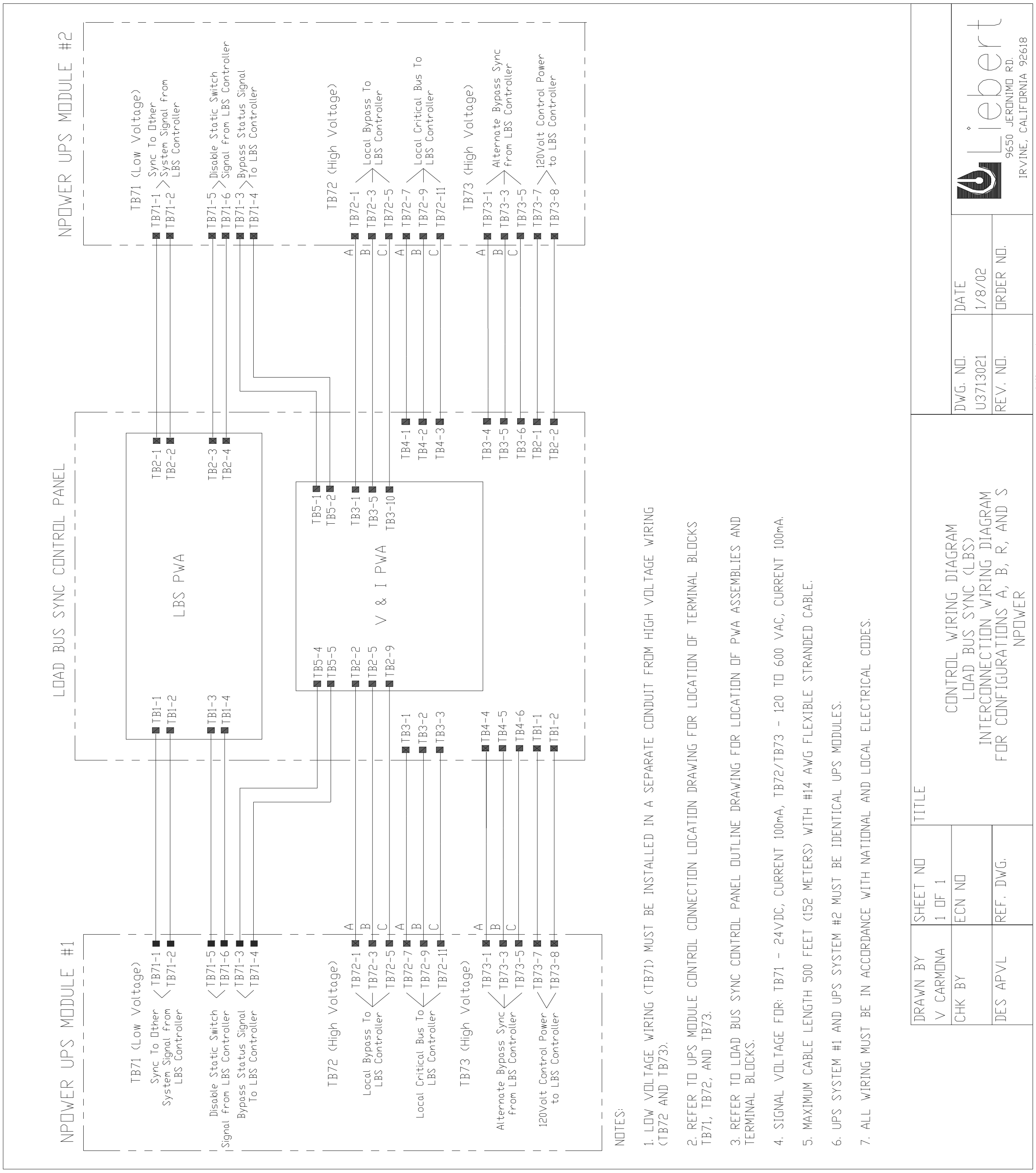


Figure 40 Control Wiring, LBS Interconnection Wiring Diagram for Configs D, E

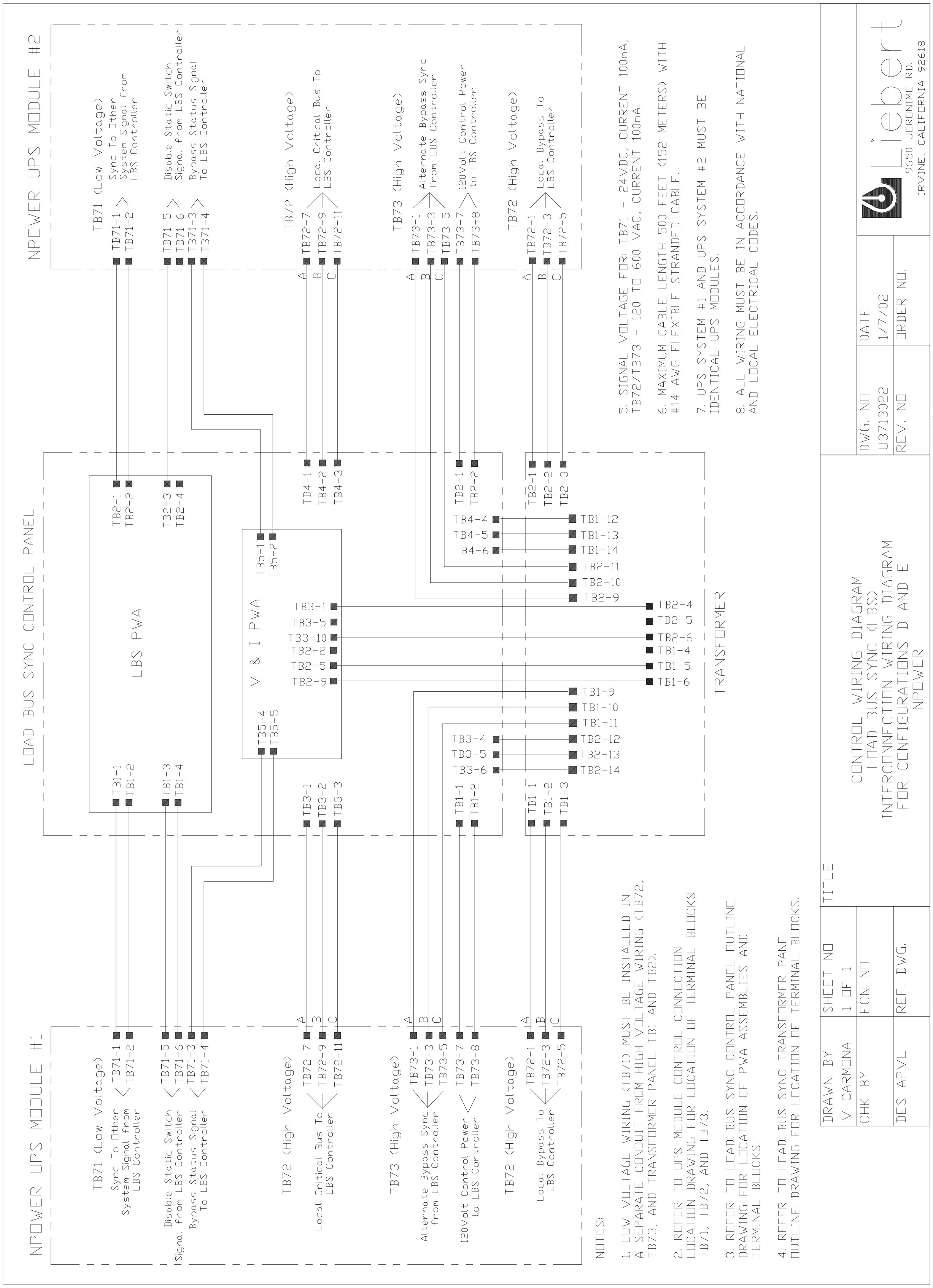


Figure 41 Control Wiring, 30 - 130 kVA UPS

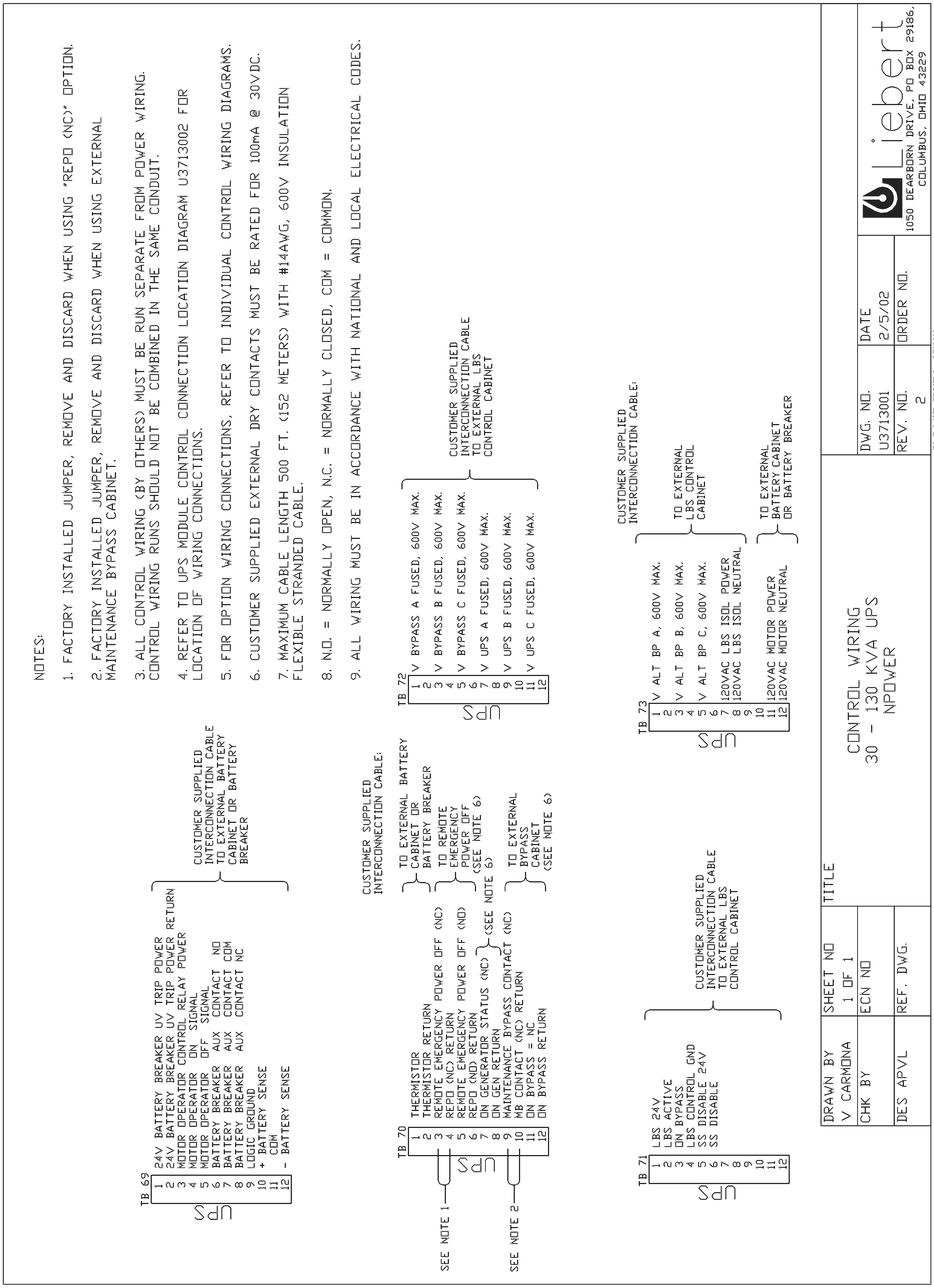


Figure 42 Control Wiring, 1+1 Category 5 Patch Cable Connection

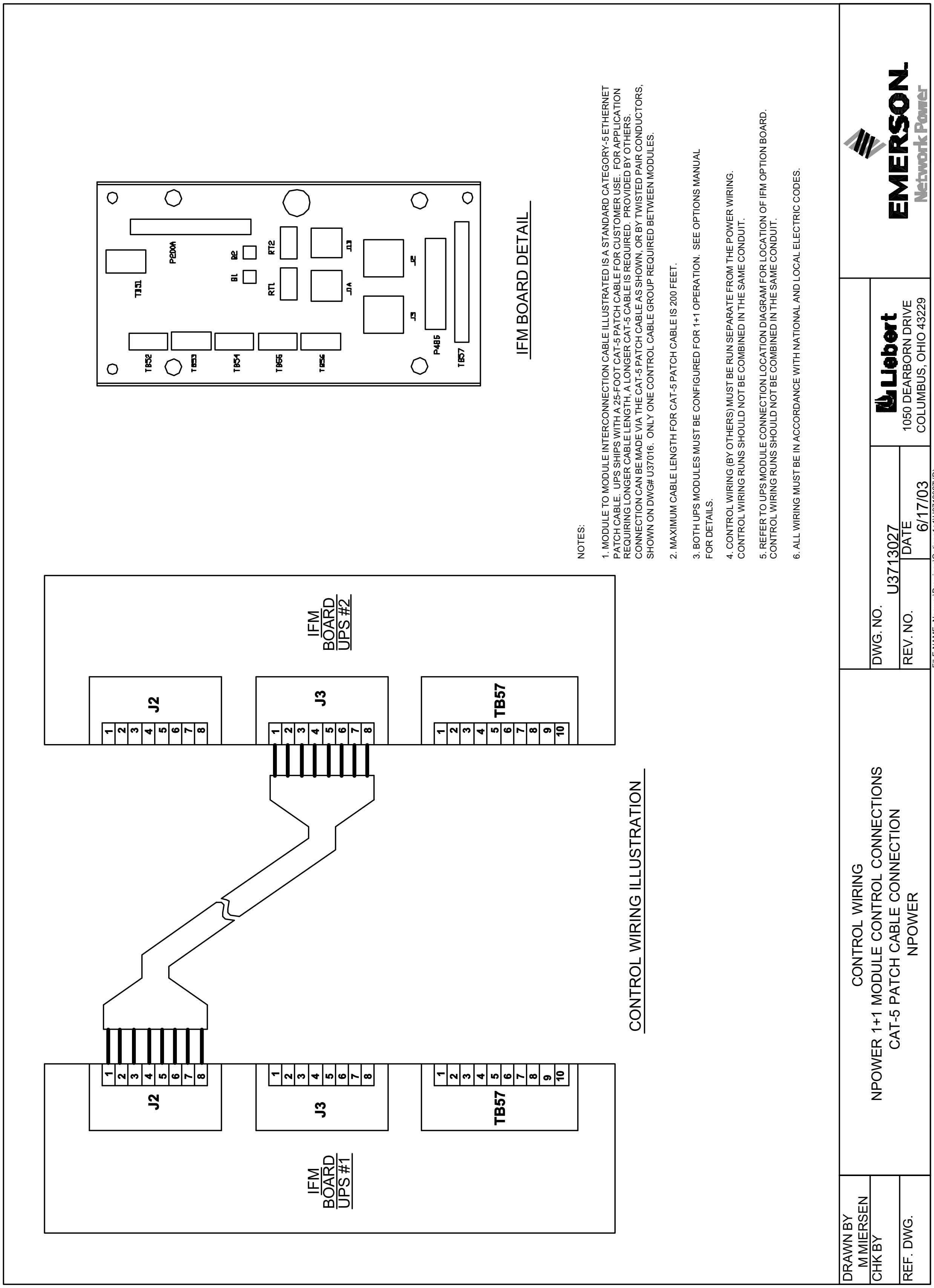


Figure 43 Control Wiring, 1+1 Twisted-Pair Cable Connection

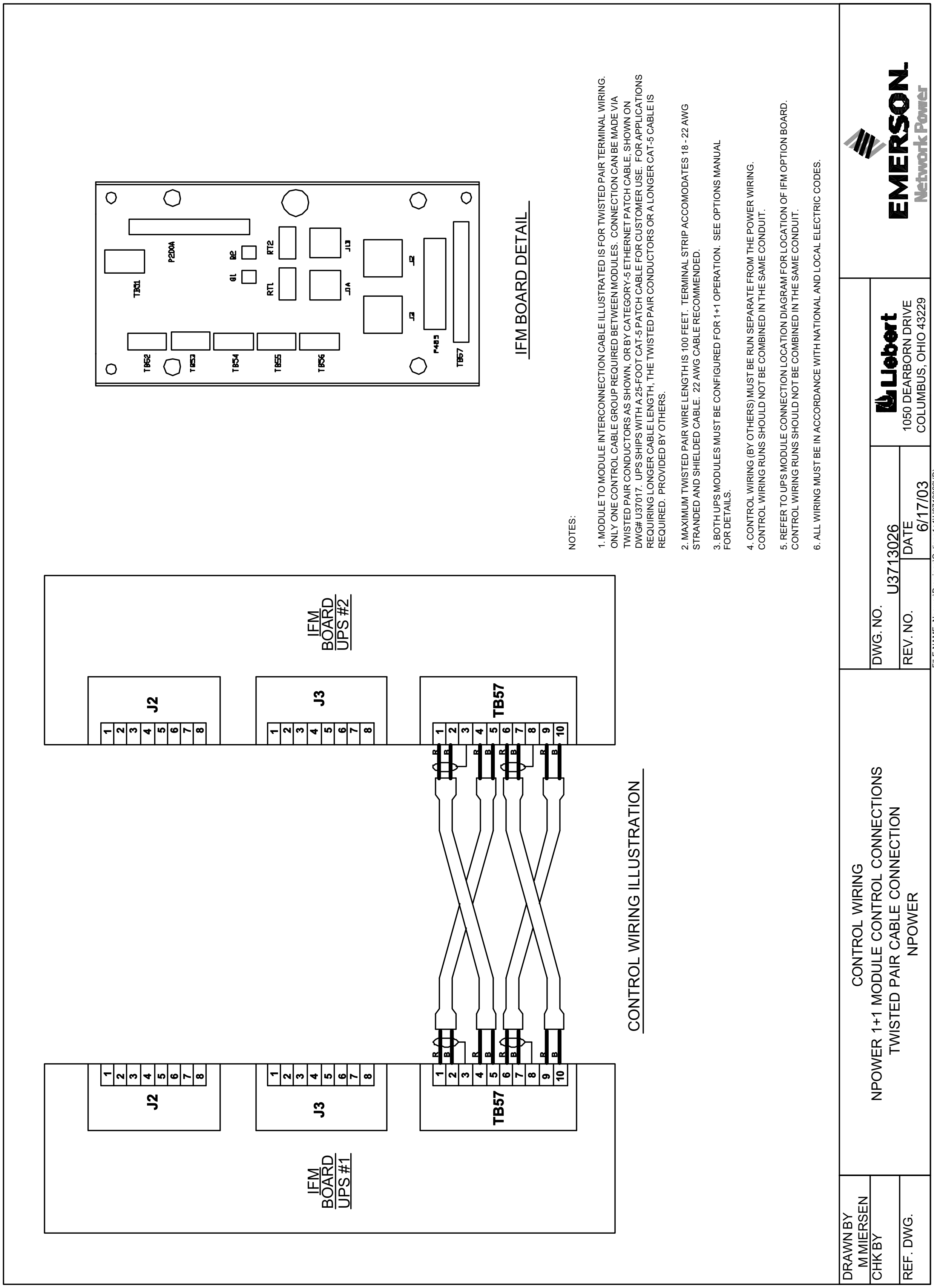


Figure 44 Control Wiring, Remote Alarm Status Panel Option

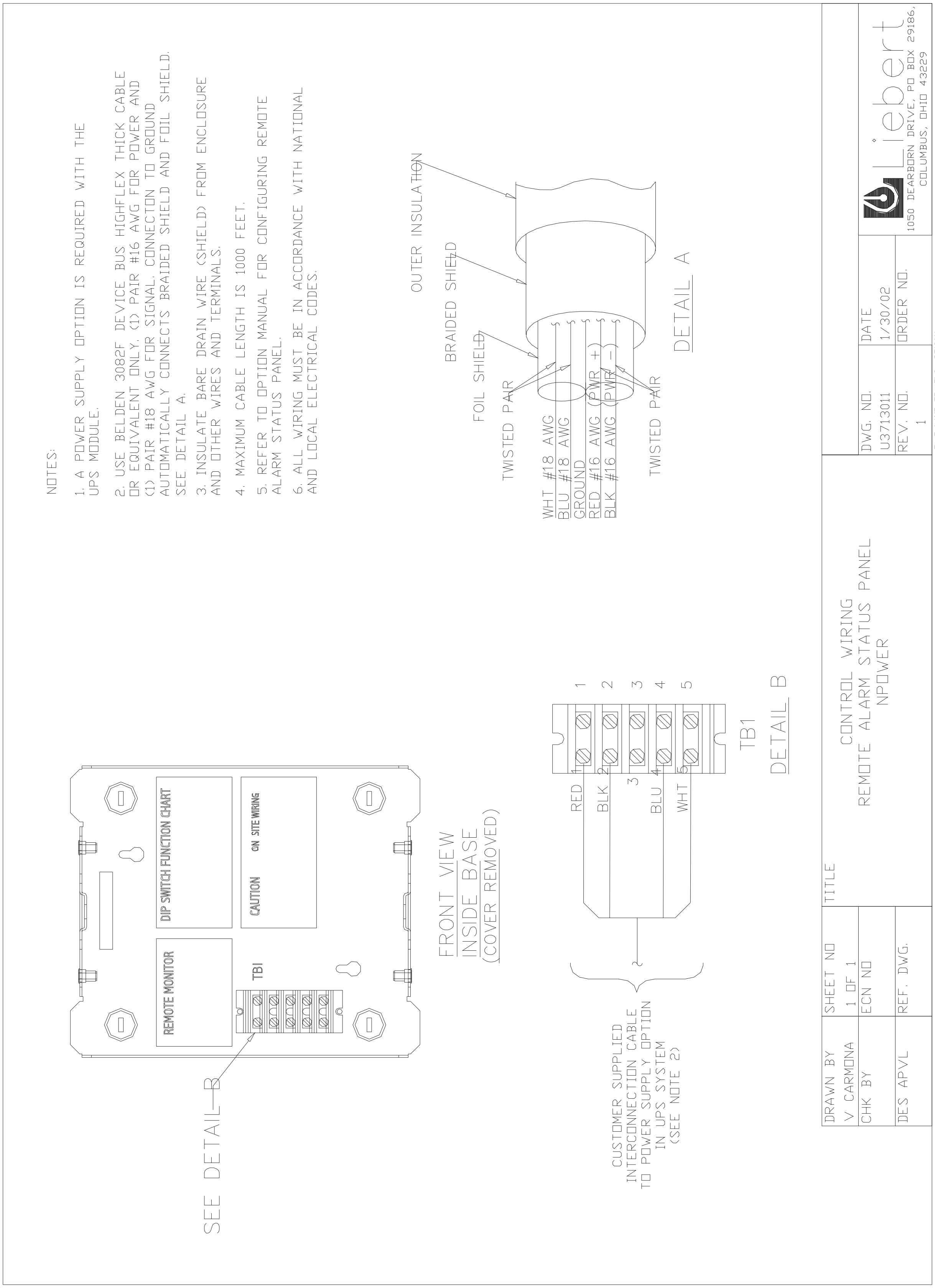


Figure 45 Control Wiring, 2 or 3 Remote Alarm Status Panels

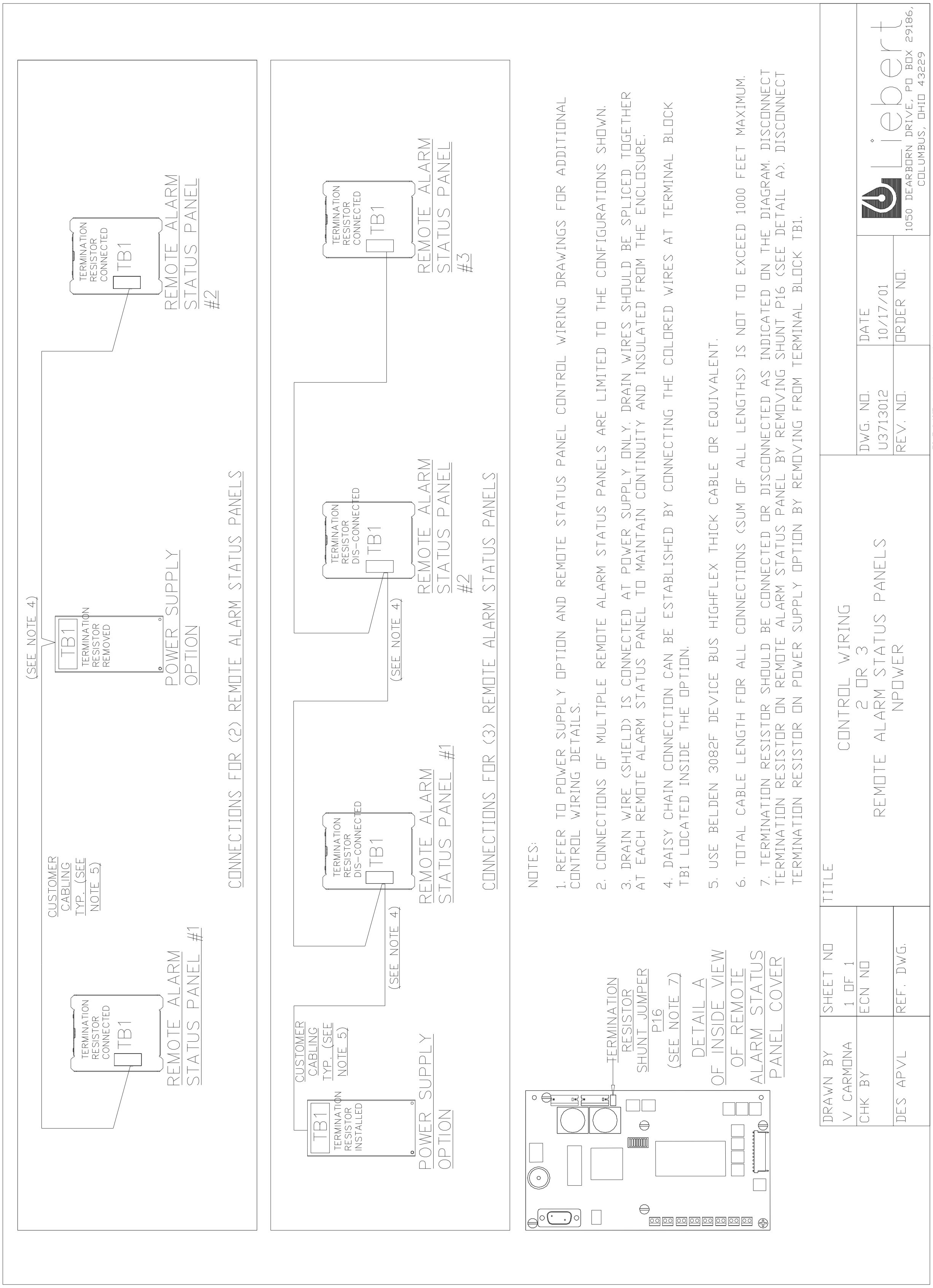


Figure 46 Control Wiring, 3 Remote Alarm Status Panels with Stub Connections

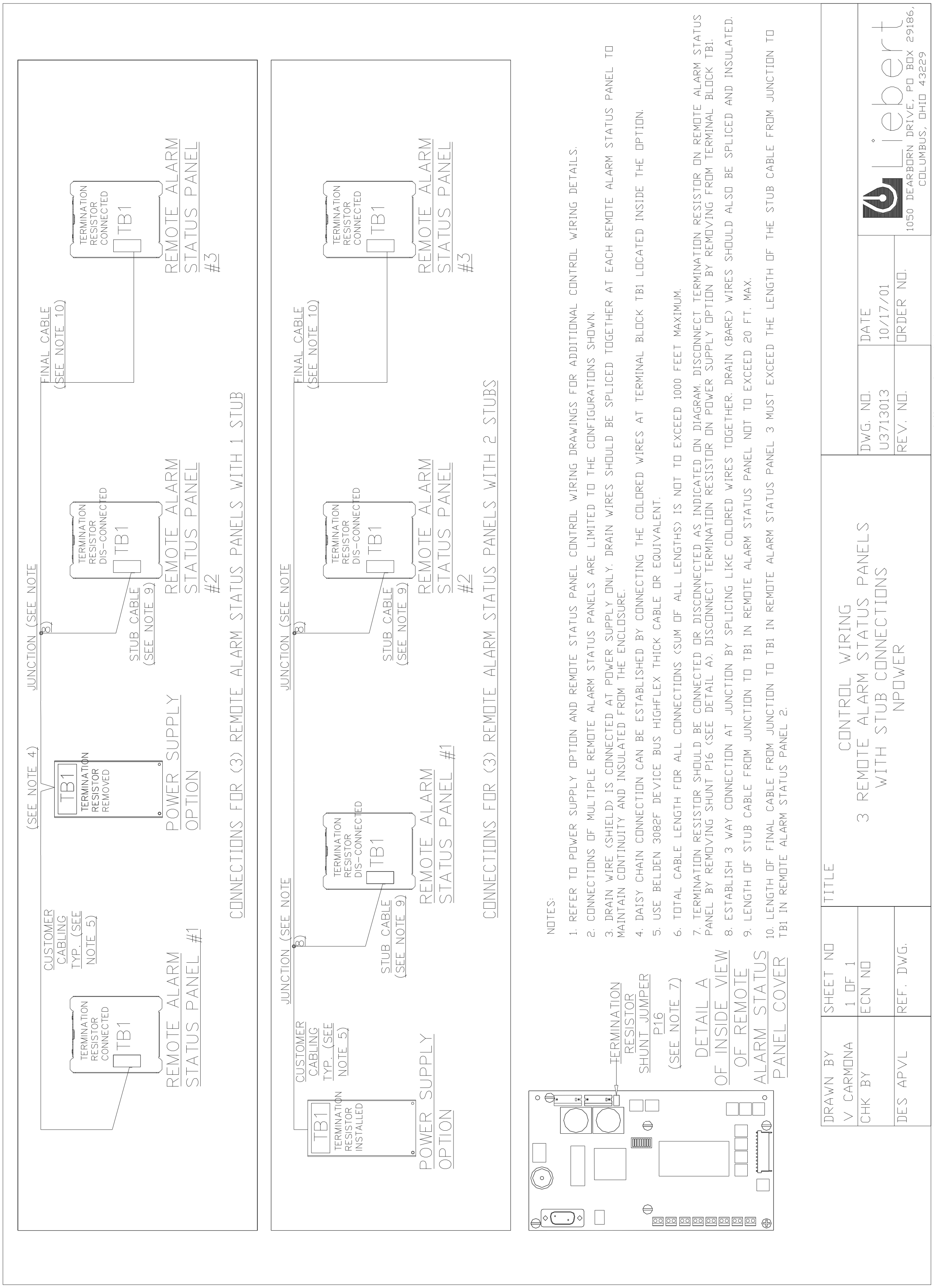


Figure 47 Control Wiring, Site Scan Interface

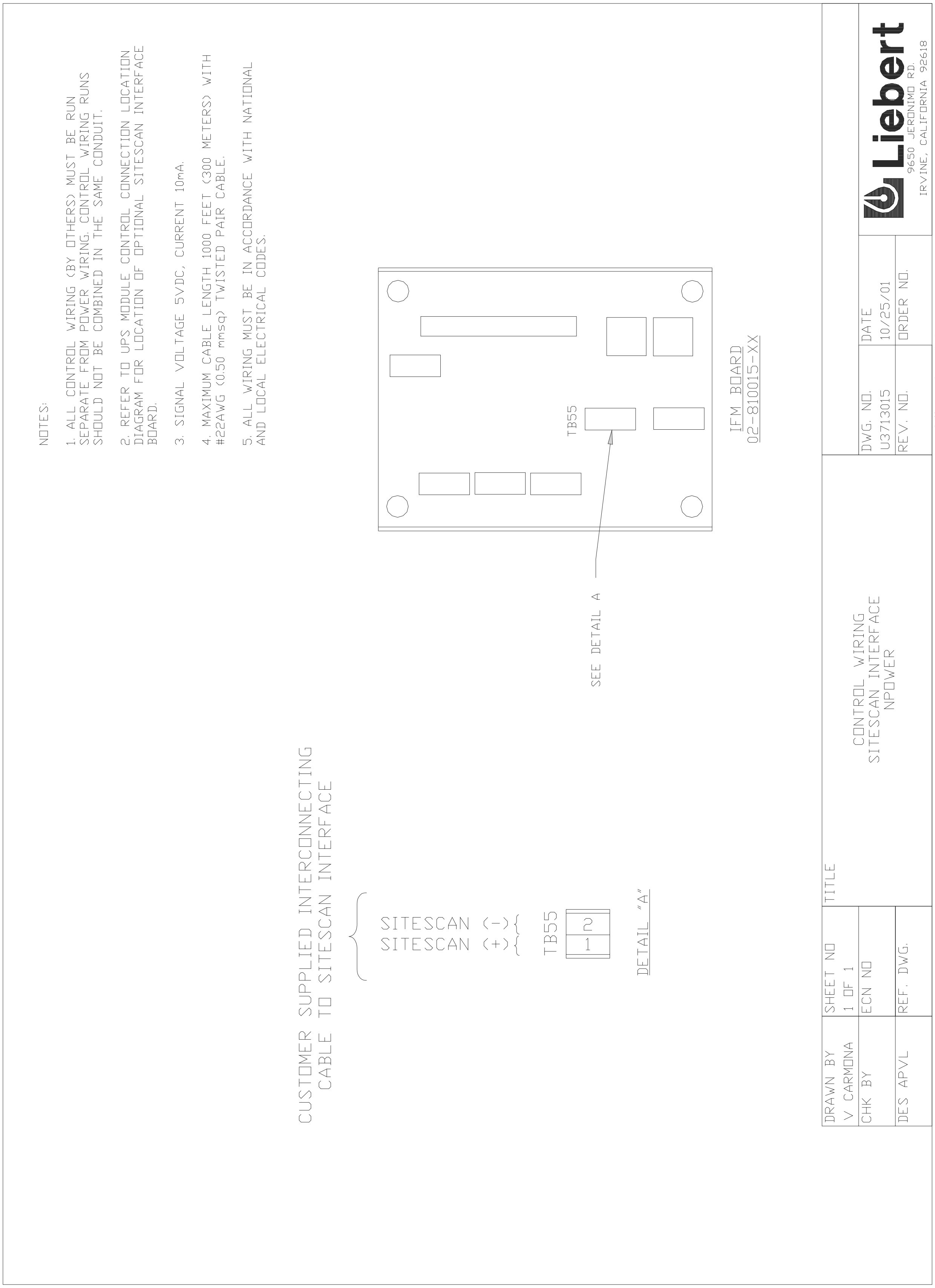


Figure 48 Control Wiring, Programmable Relay Board Option

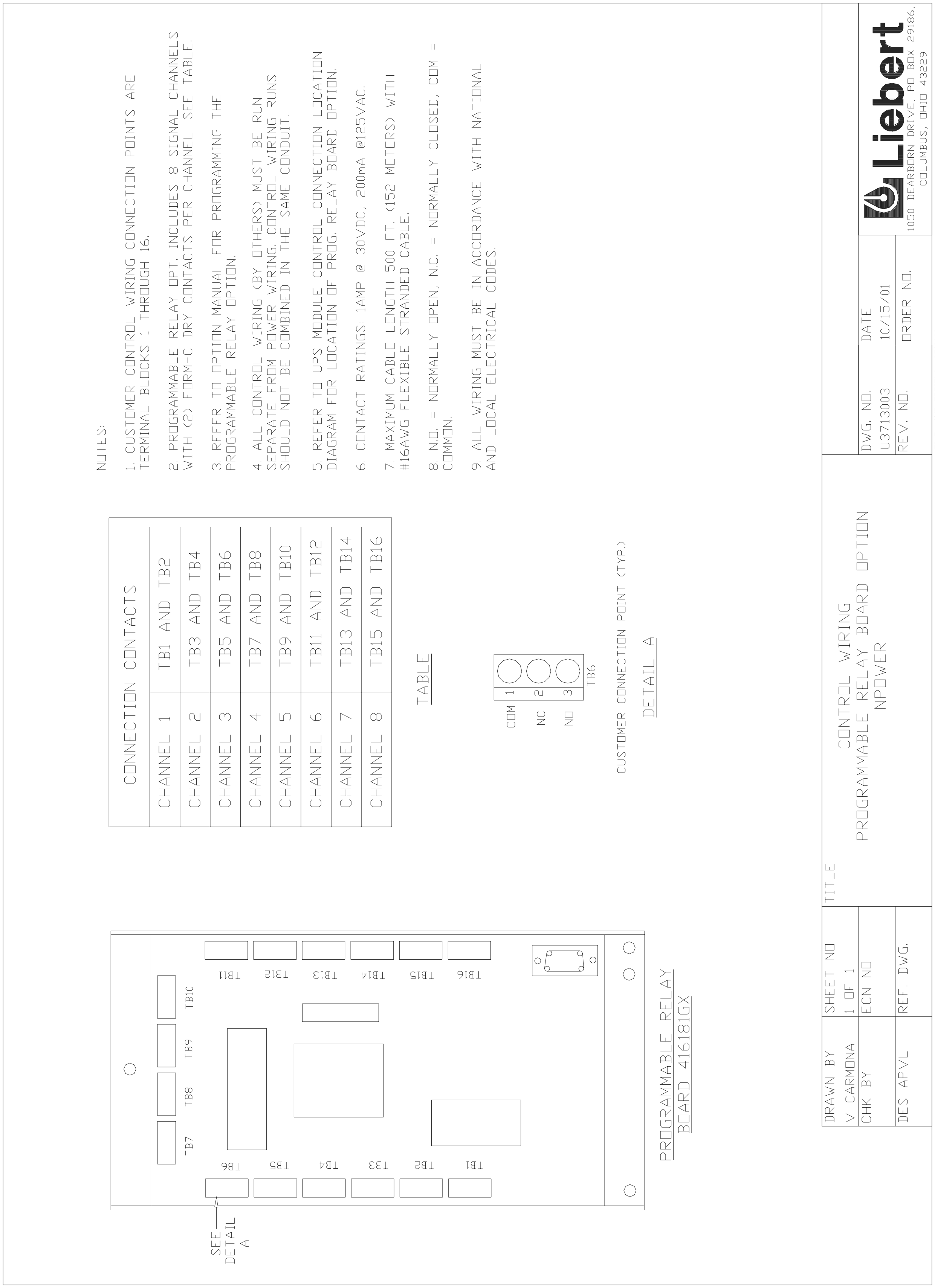


Figure 49 Control Wiring, Input Contact Isolator Board

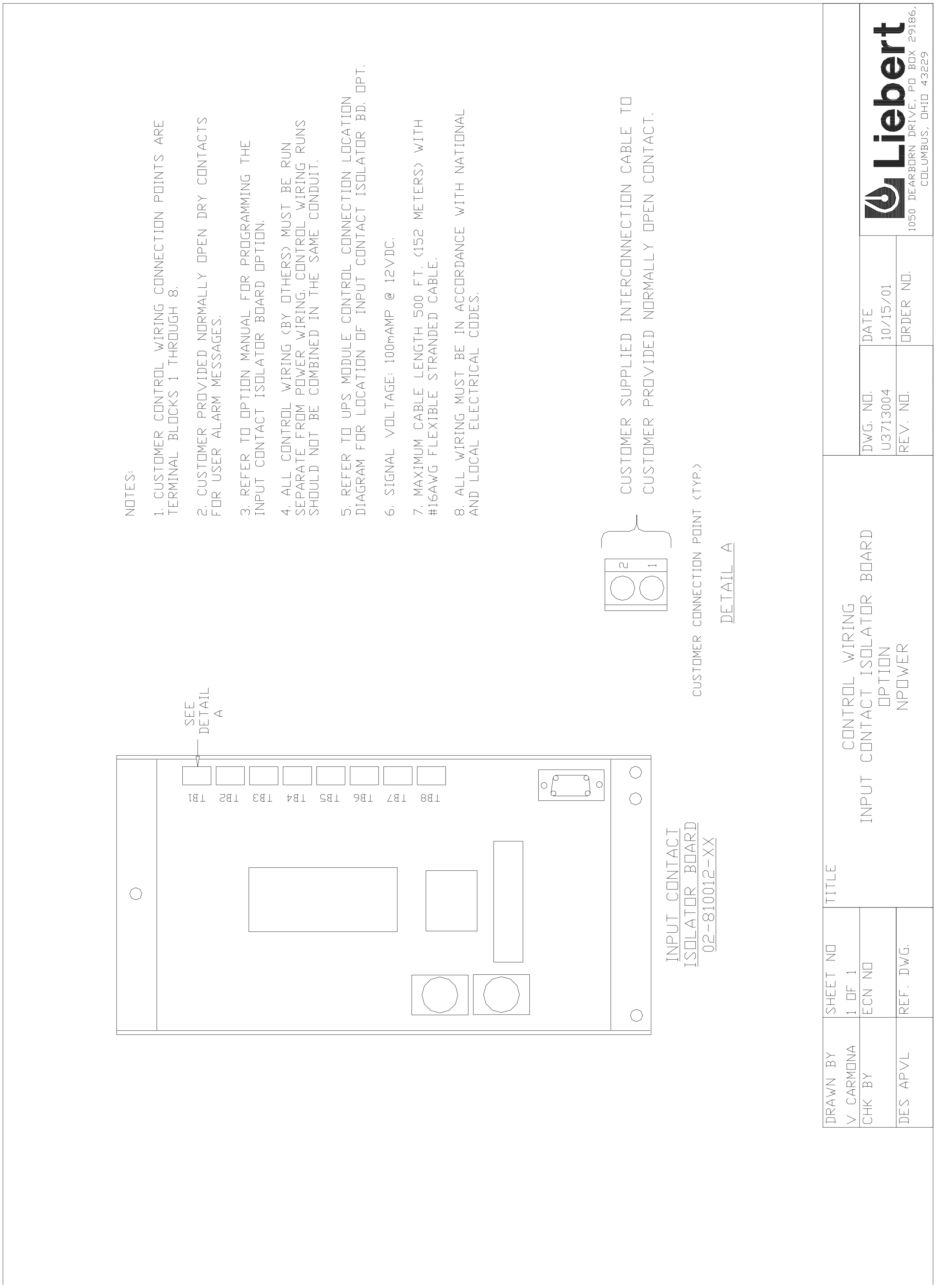


Figure 50 Control Wiring, NIC Option

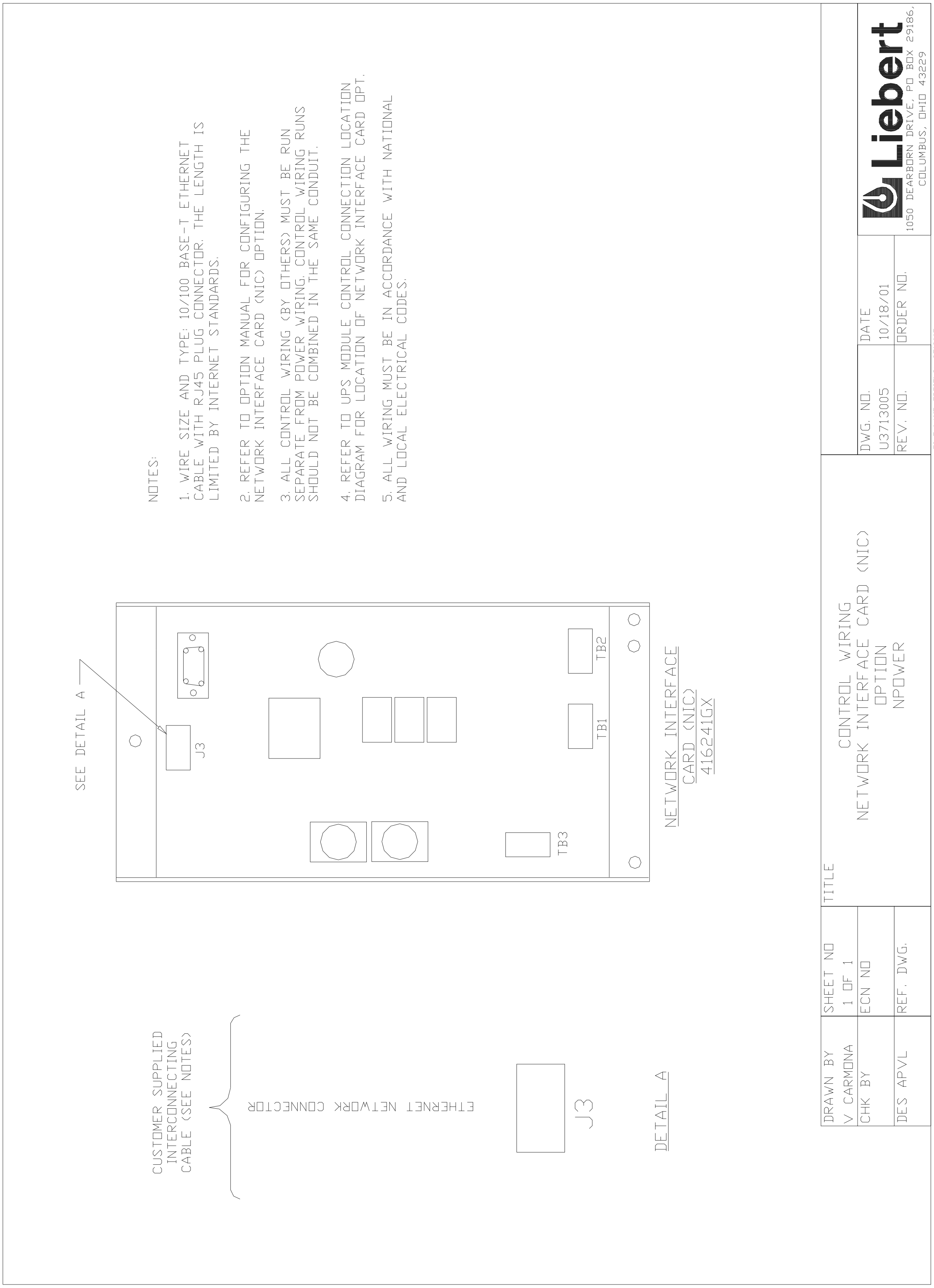


Figure 51 Control Wiring, Power Supply Option

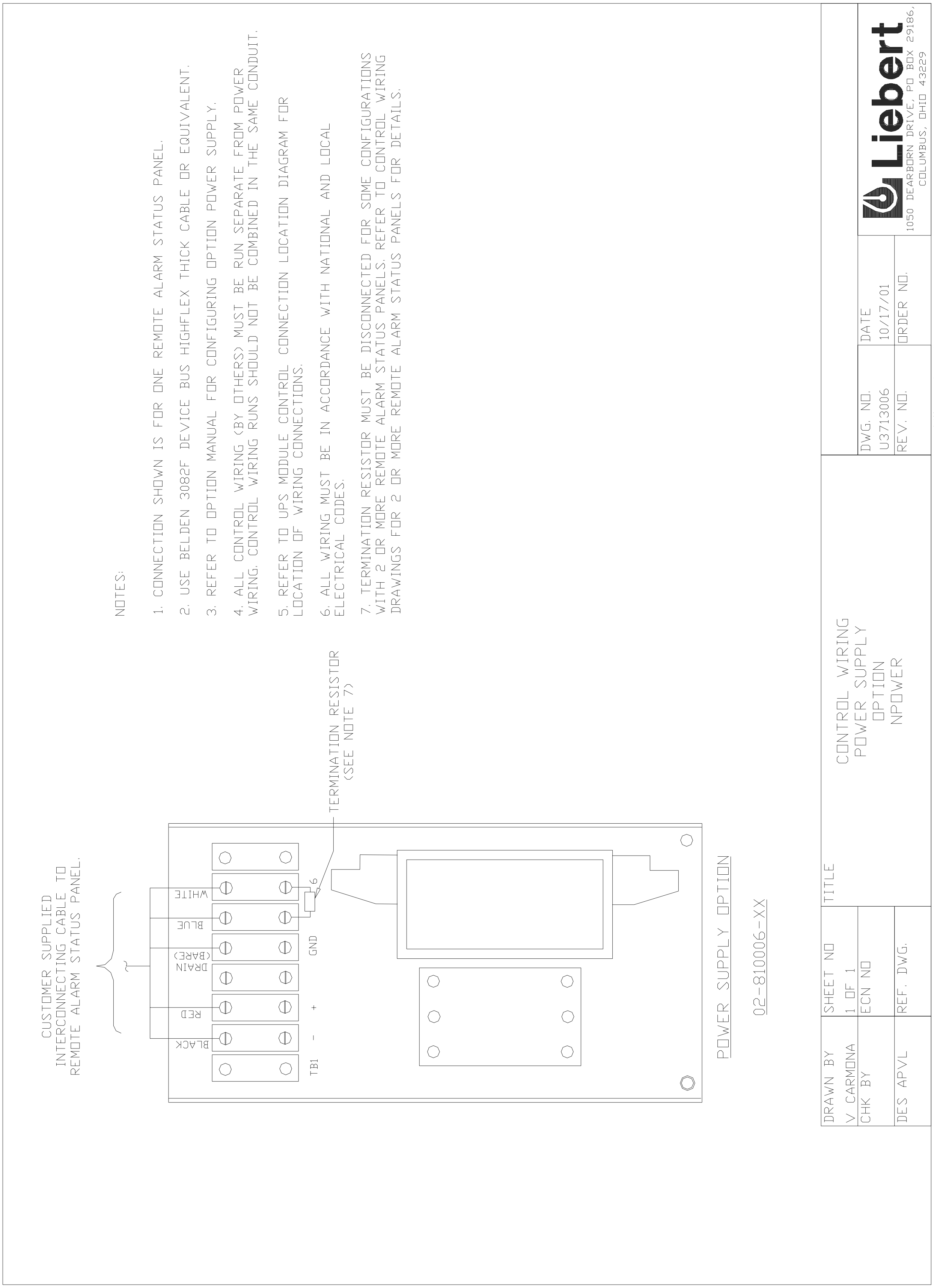


Figure 52 Control Wiring, Internal Modem Option

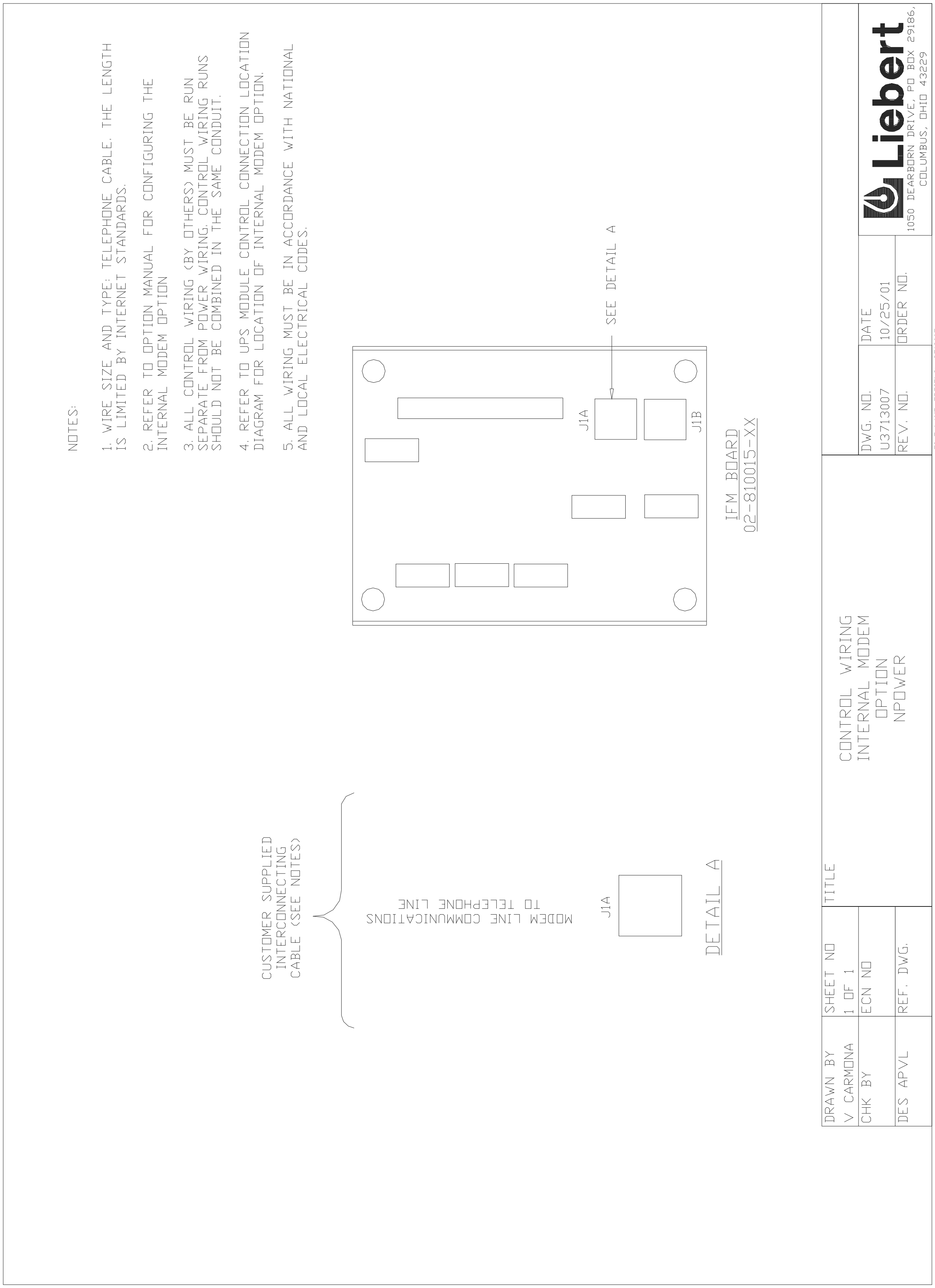


Figure 53 Control Wiring, AS 400 Signal Cable Option

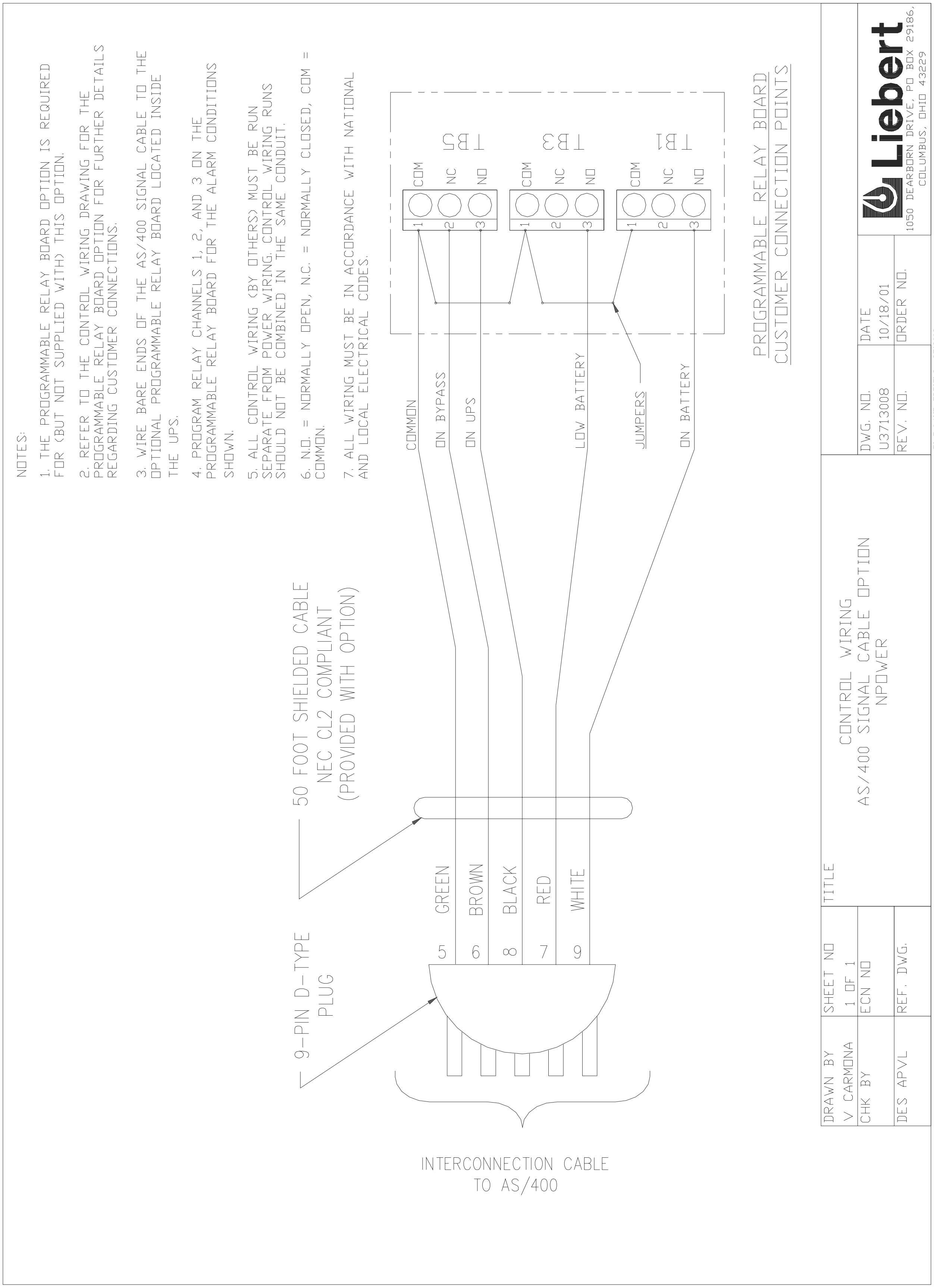


Figure 54 Control Wiring, Open Wire Cable Adaptor Option

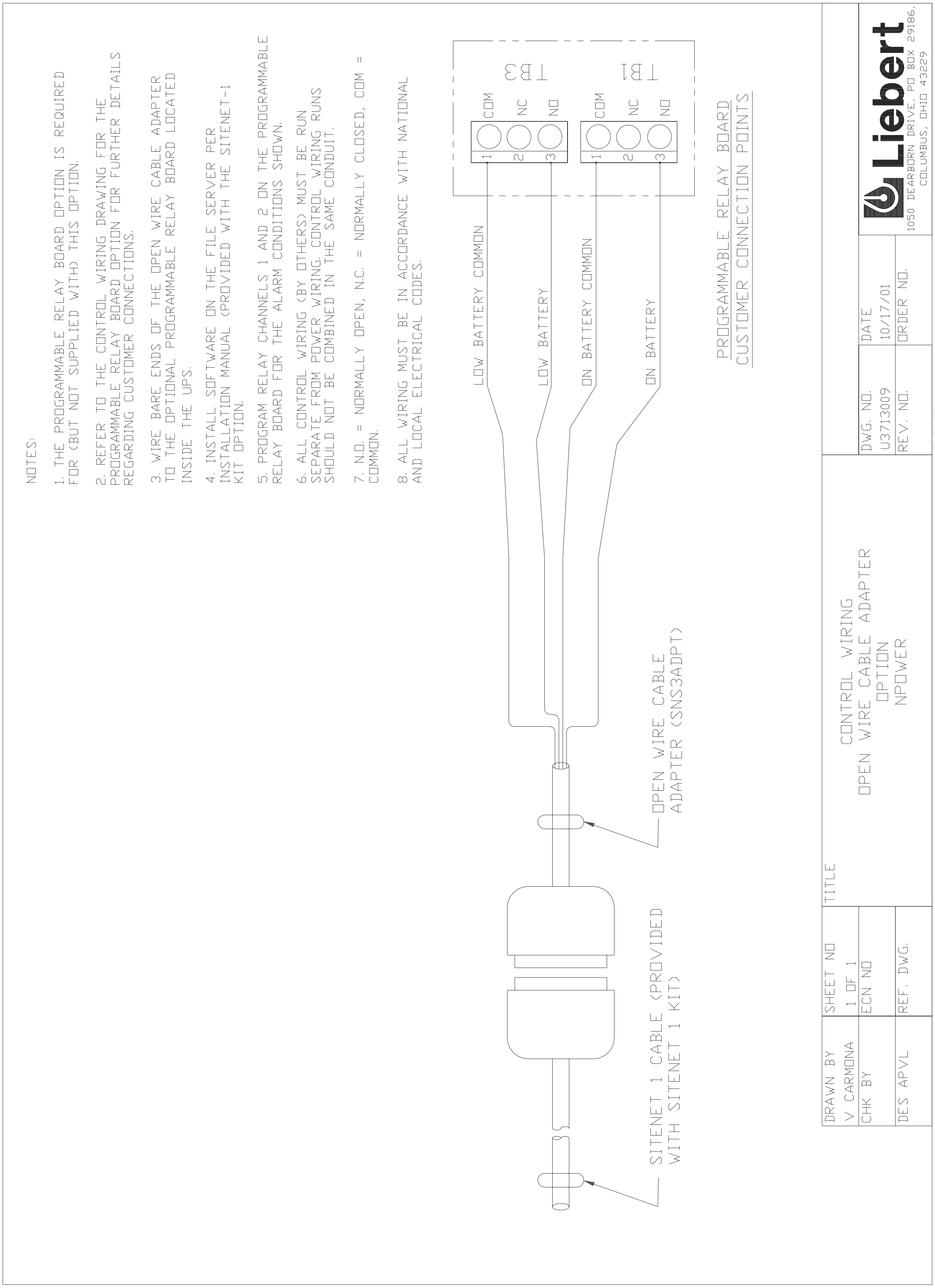


Figure 55 Control Connection Diagram 50 --130 kVA

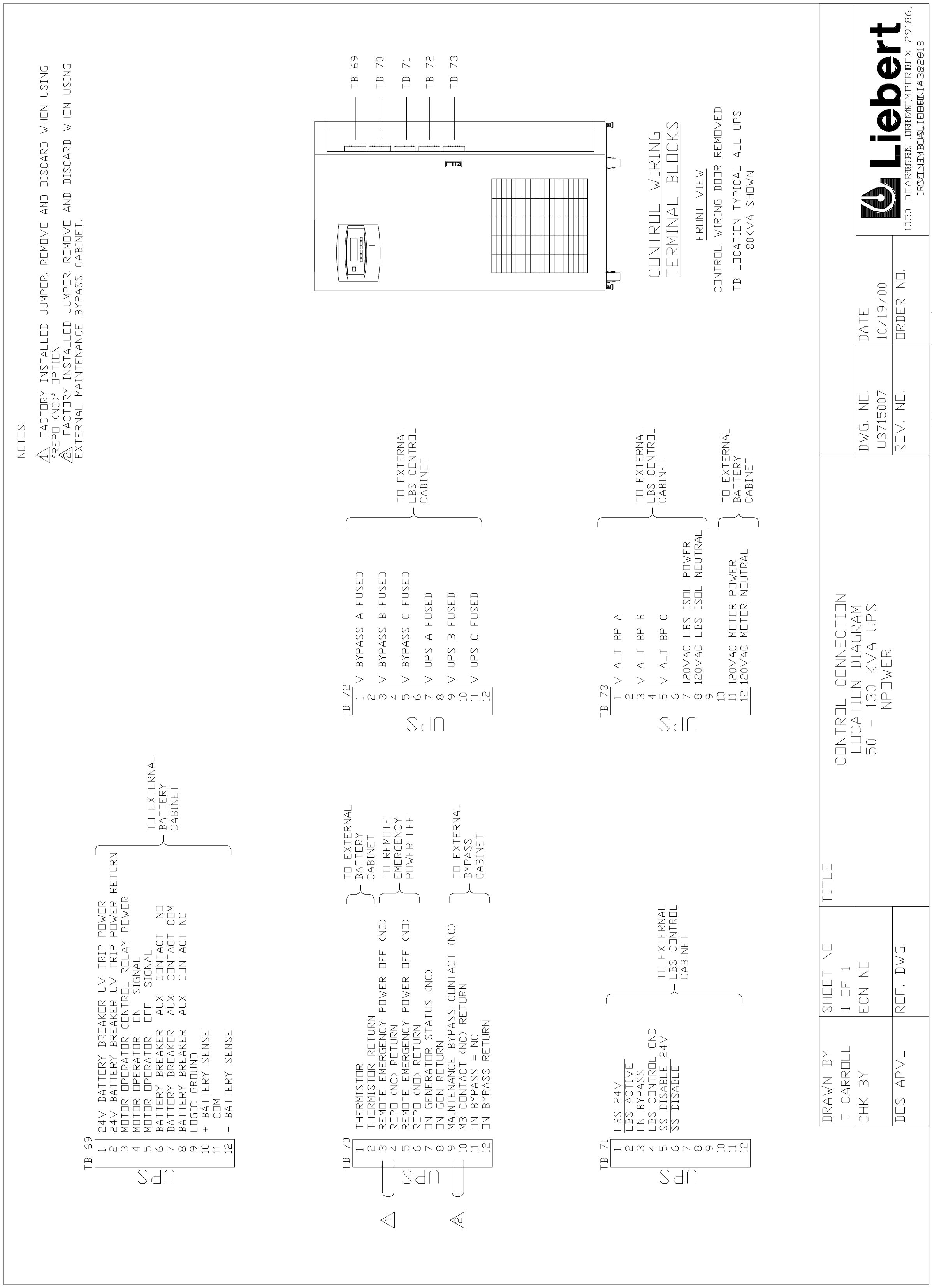


Figure 56 Control Connection Location Diagram, 30-130 kVA UPS

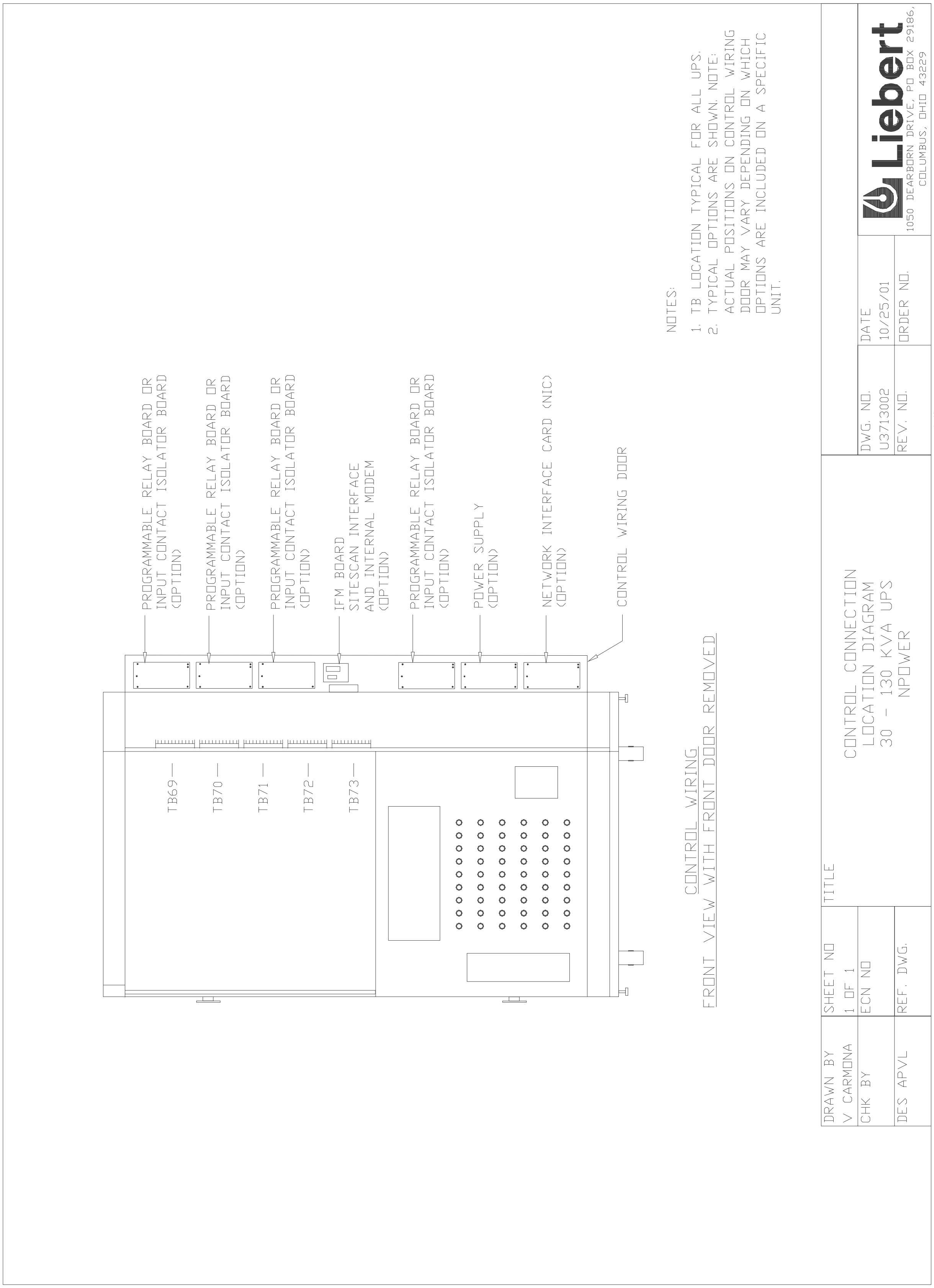


Figure 57 Terminal Details, 30 - 50 kVA UPS

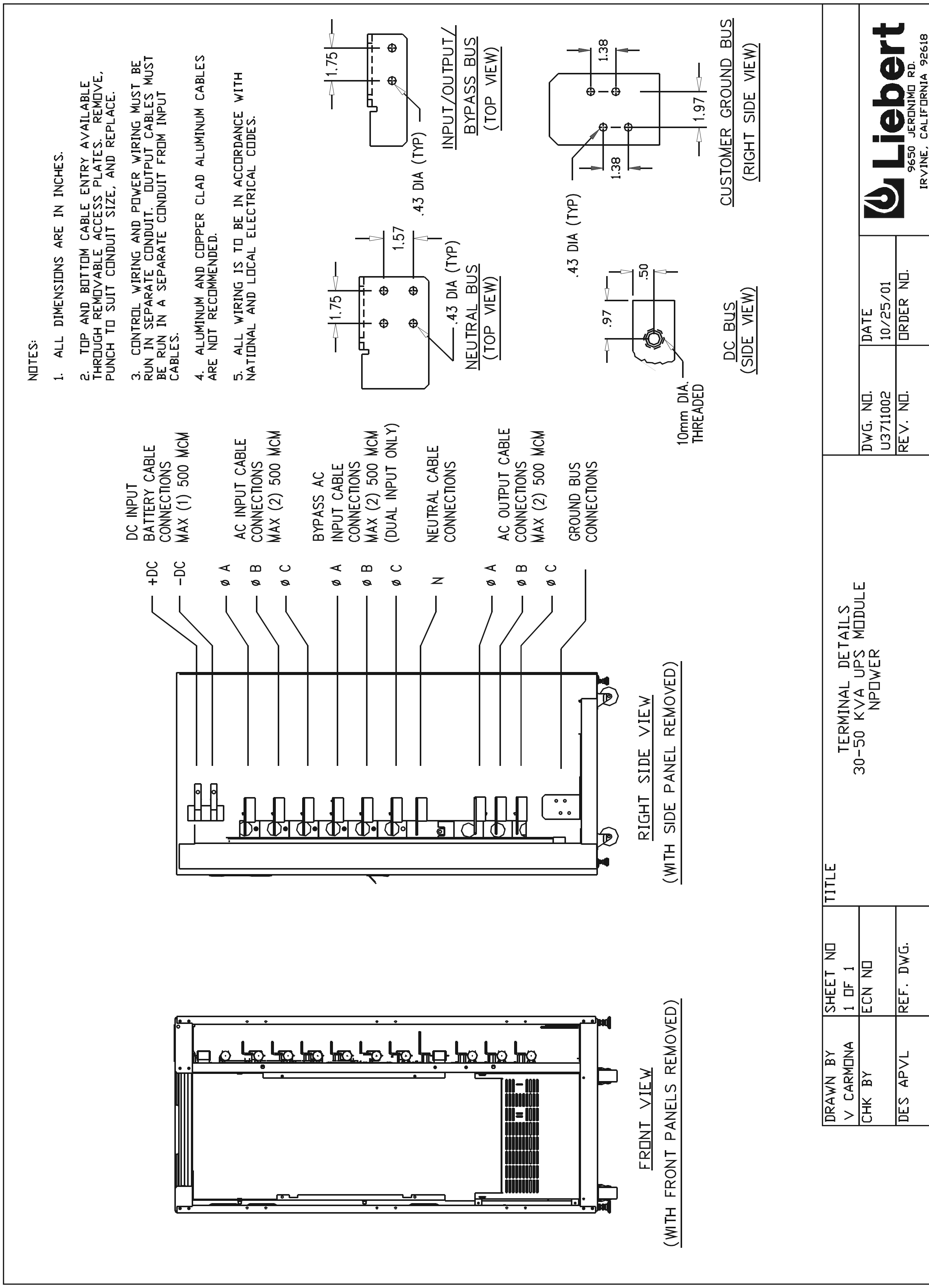


Figure 58 Terminal Details, 65 - 80 kVA UPS

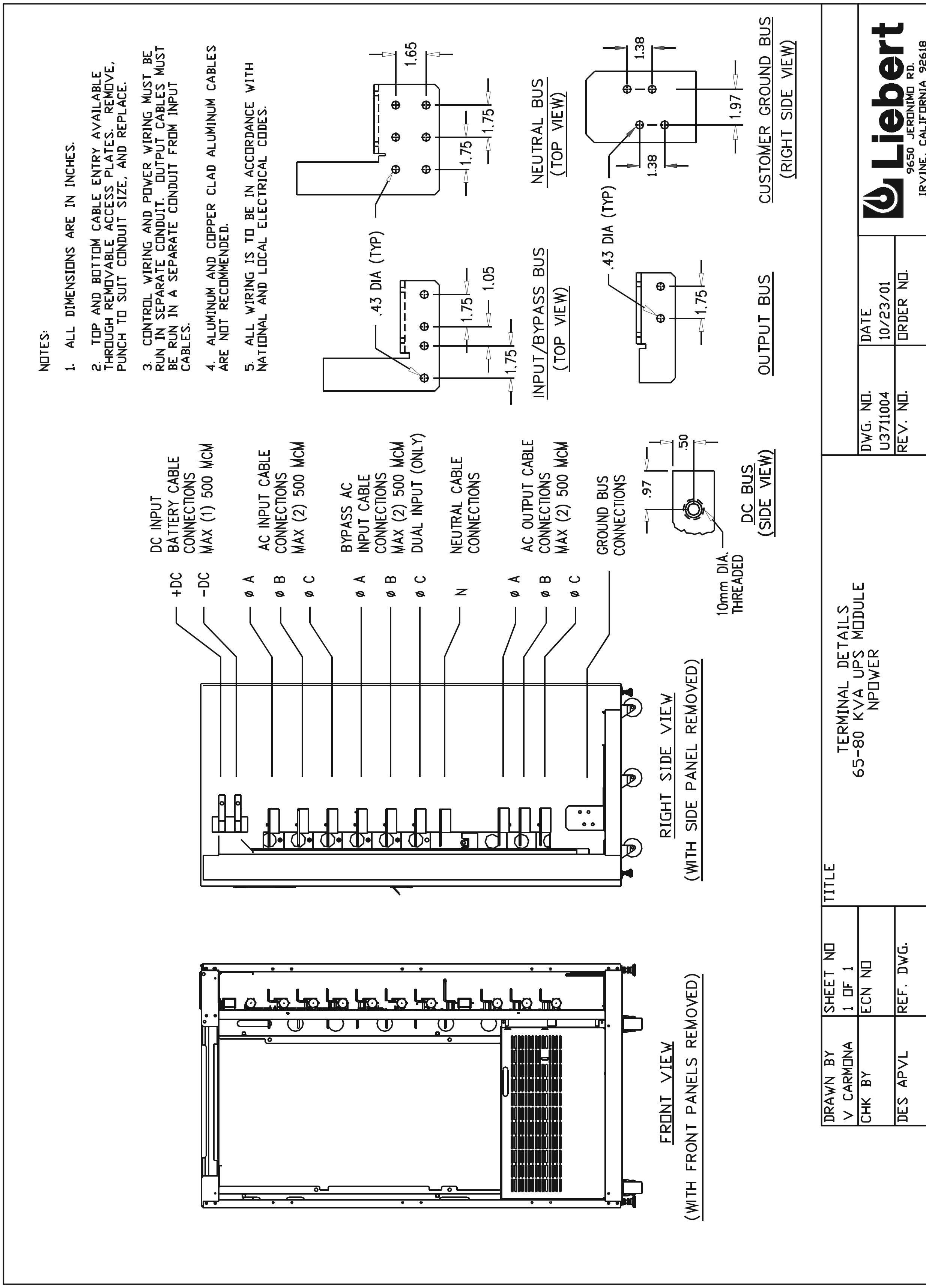


Figure 59 Terminal Details, 100 - 130 kVA UPS

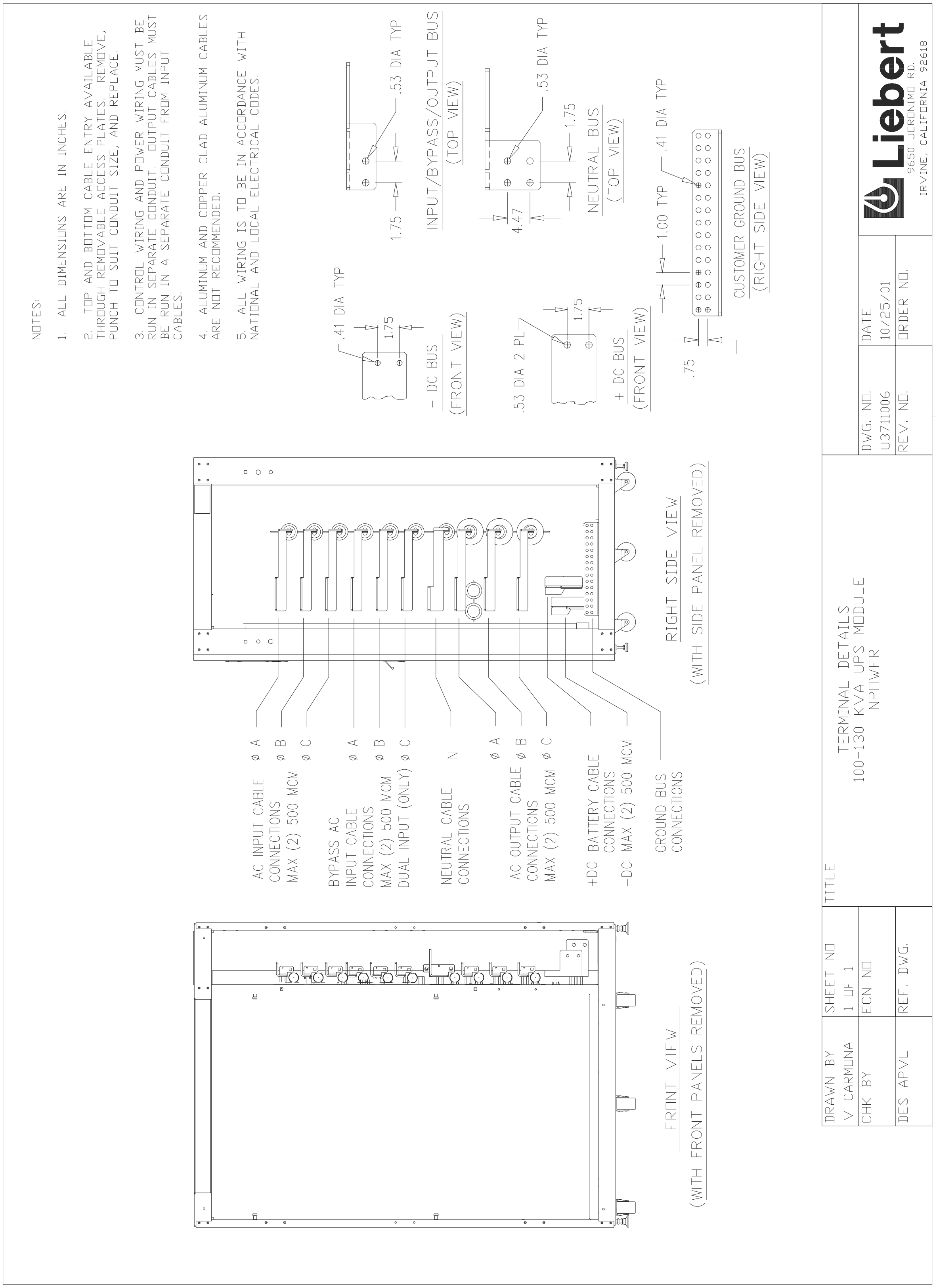


Figure 60 Schematic Diagram Maintenance Bypass Interlock System

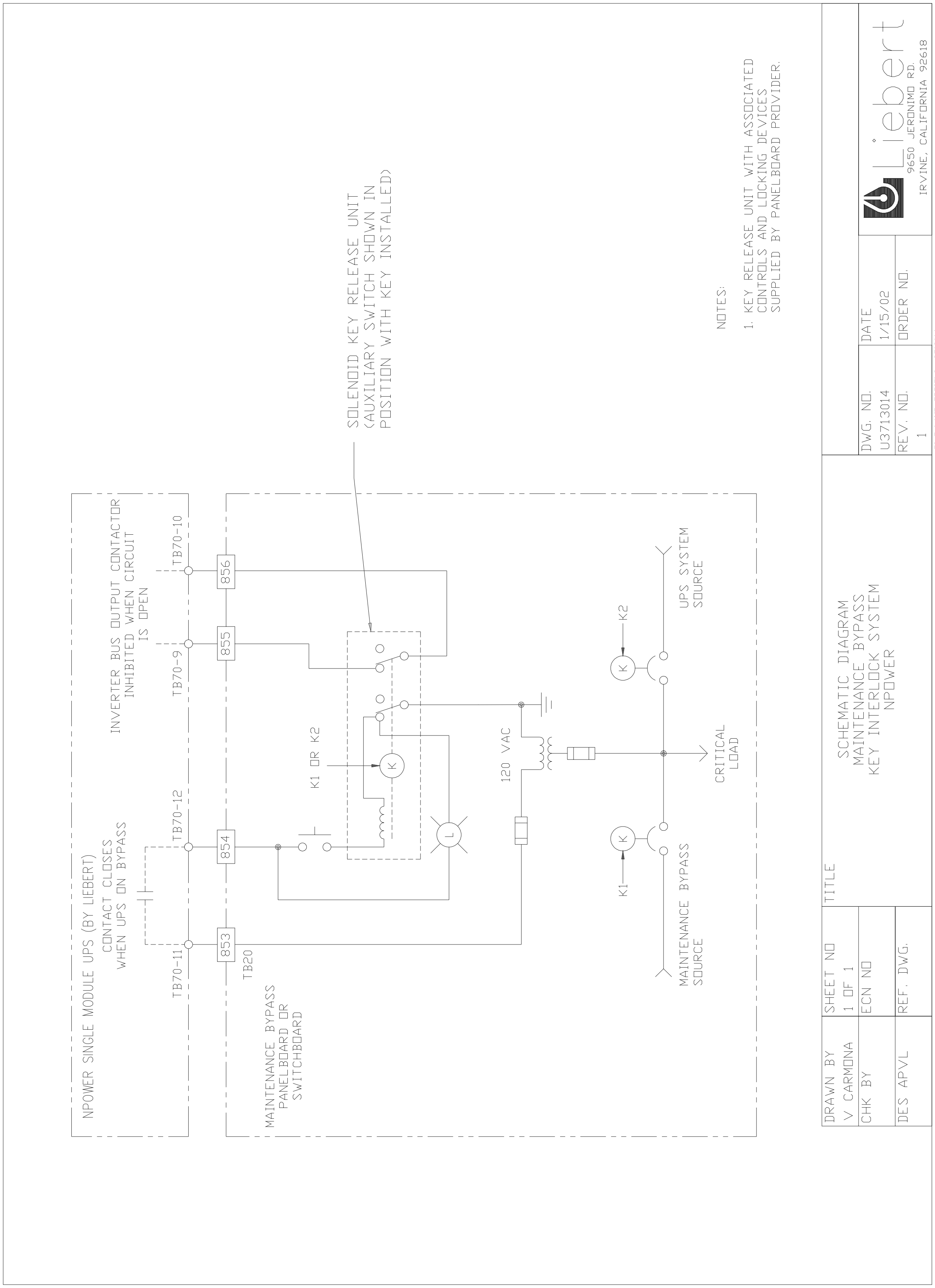


Figure 61 Schematic Diagram Maintenance Bypass Interlock System with EPO

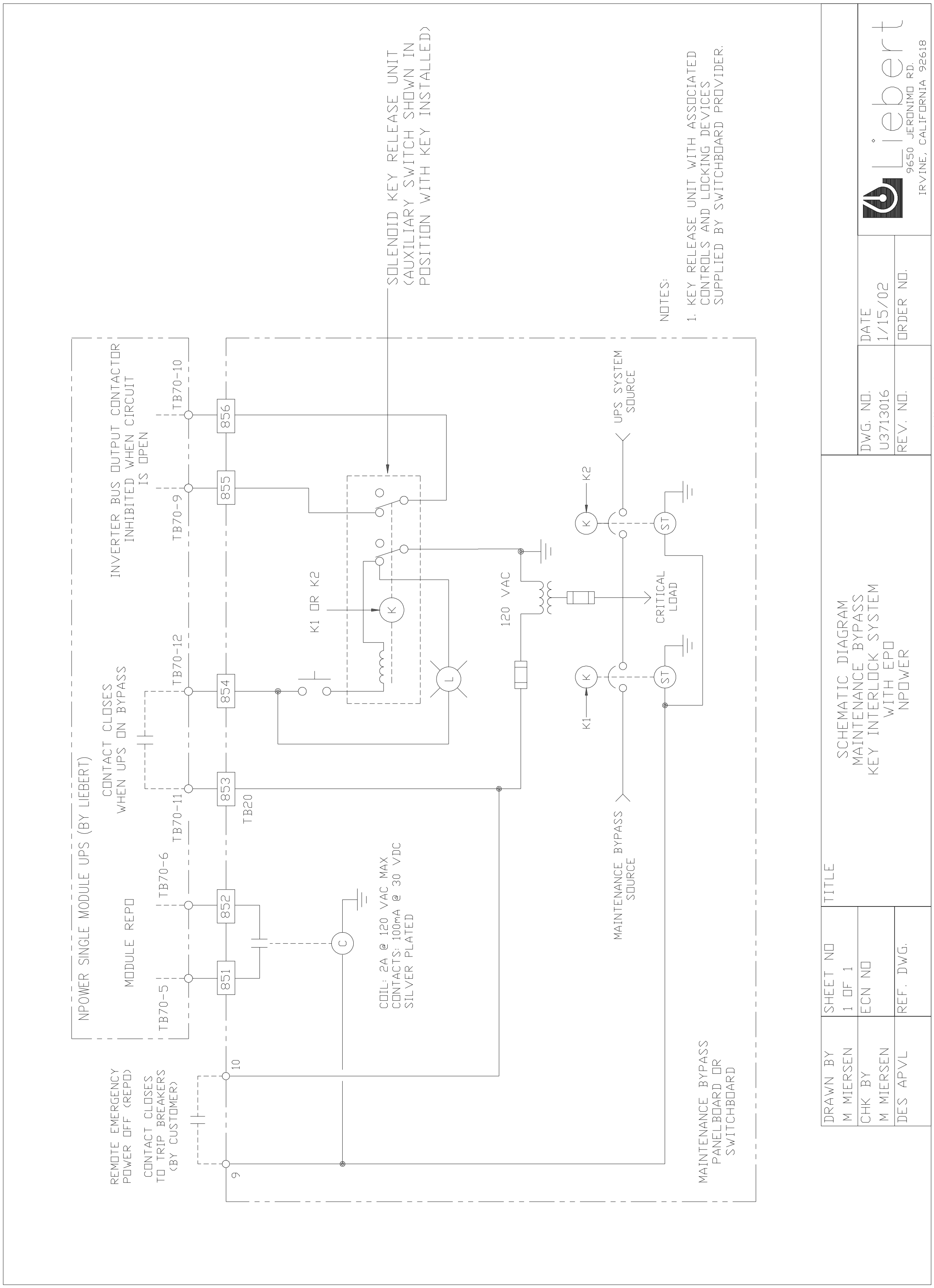
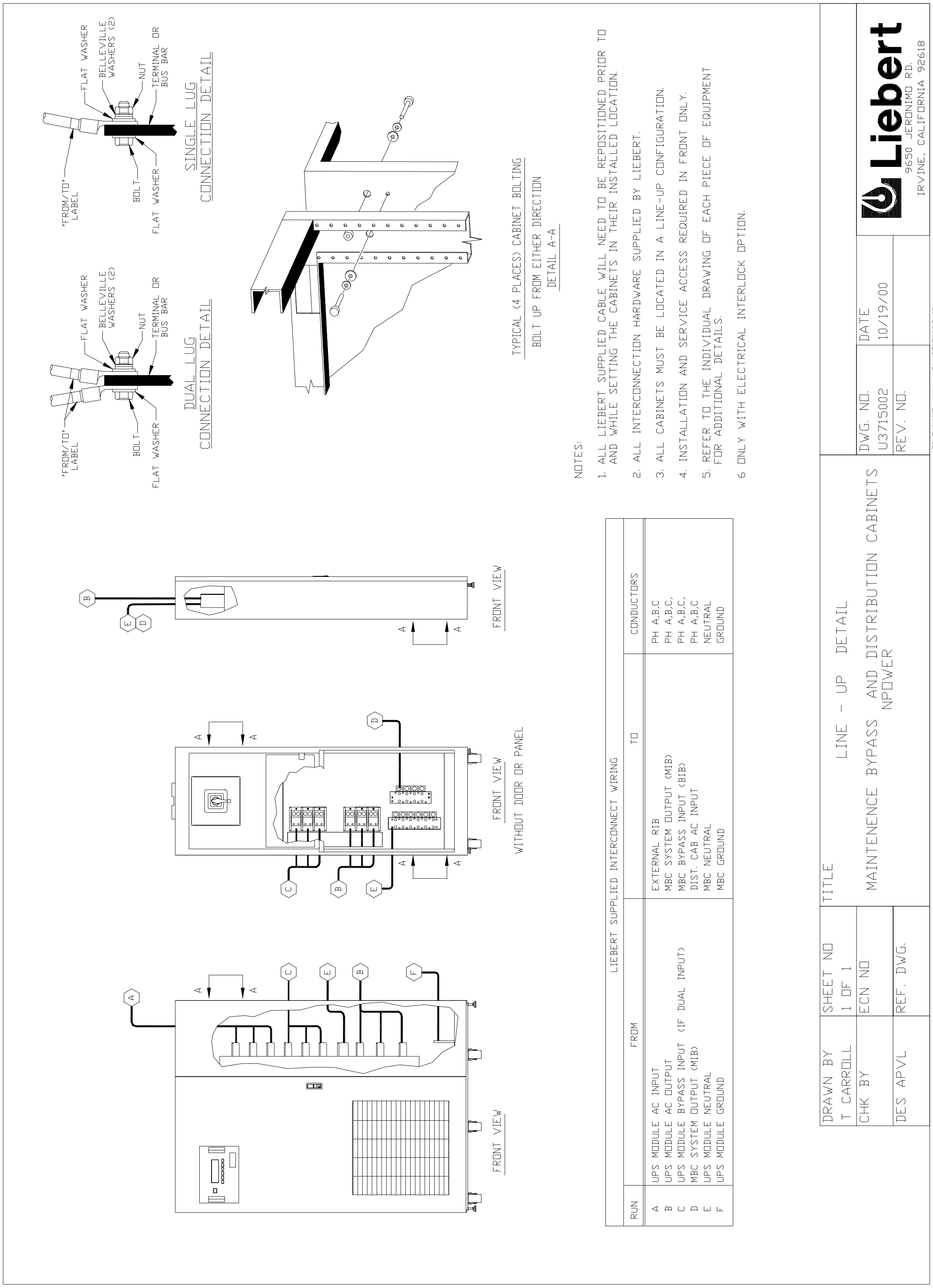


Figure 62 Line-Up Detail Maintenance Bypass and Distribution Cabinets



LIEBERT SUPPLIED INTERCONNECT WIRING

RUN	FROM	TO	CONDUCTORS
A	UPS MODULE AC INPUT	EXTERNAL RIB	PH A,B,C
B	UPS MODULE AC OUTPUT	MBC SYSTEM OUTPUT (MIB)	PH A,B,C,
C	UPS MODULE BYPASS INPUT (IF DUAL INPUT)	MBC BYPASS INPUT (BIB)	PH A,B,C,
D	MBC SYSTEM OUTPUT (MIB)	DIST. CAB AC INPUT	PH A,B,C
E	UPS MODULE NEUTRAL	MBC NEUTRAL	NEUTRAL
F	UPS MODULE GROUND	MBC GROUND	GROUND

Figure 63 Wiring Diagram, UPS with Single Battery Cabinet

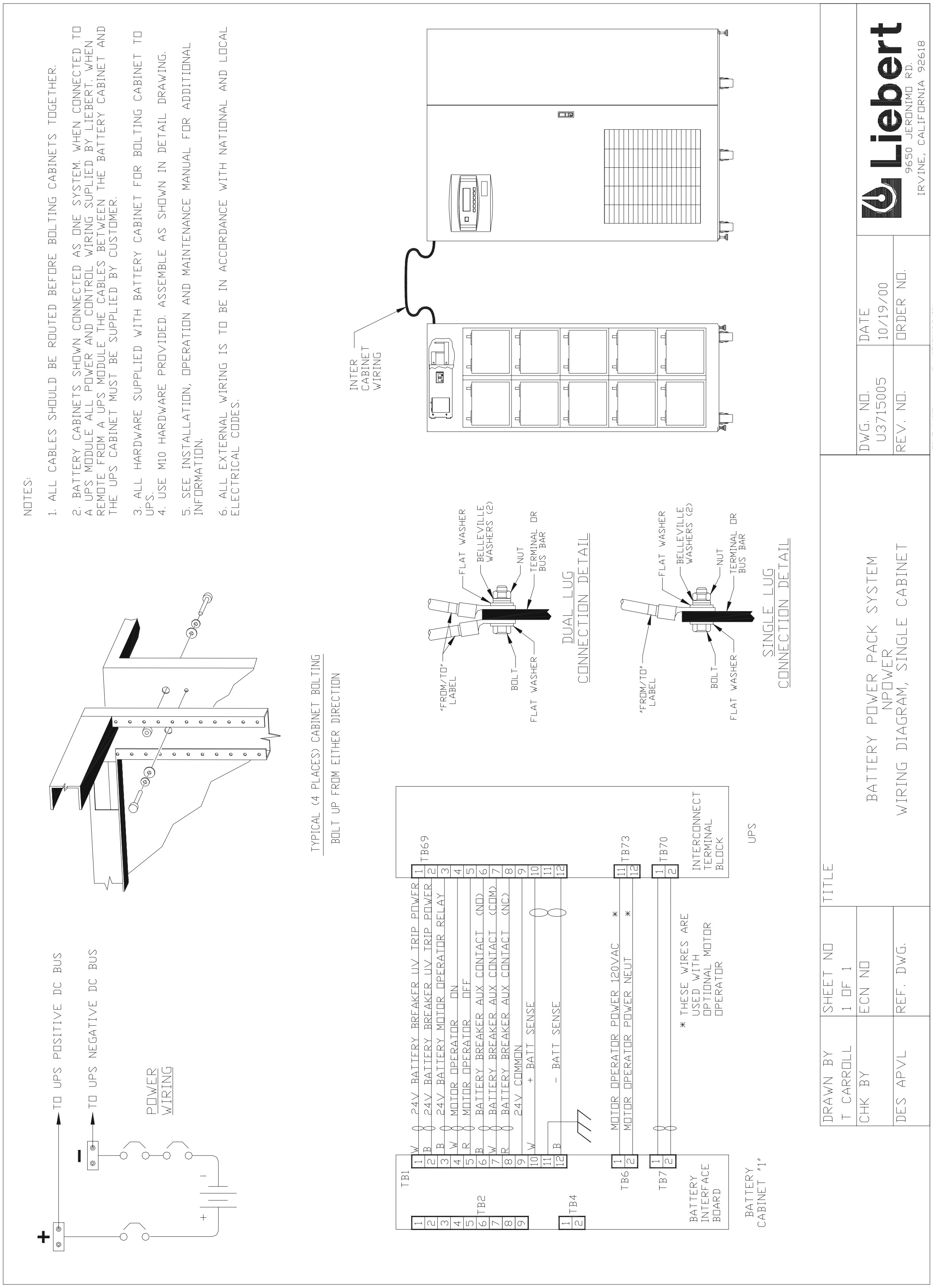


Figure 64 Interconnection Diagram, UPS Module with Multiple Battery Cabinets

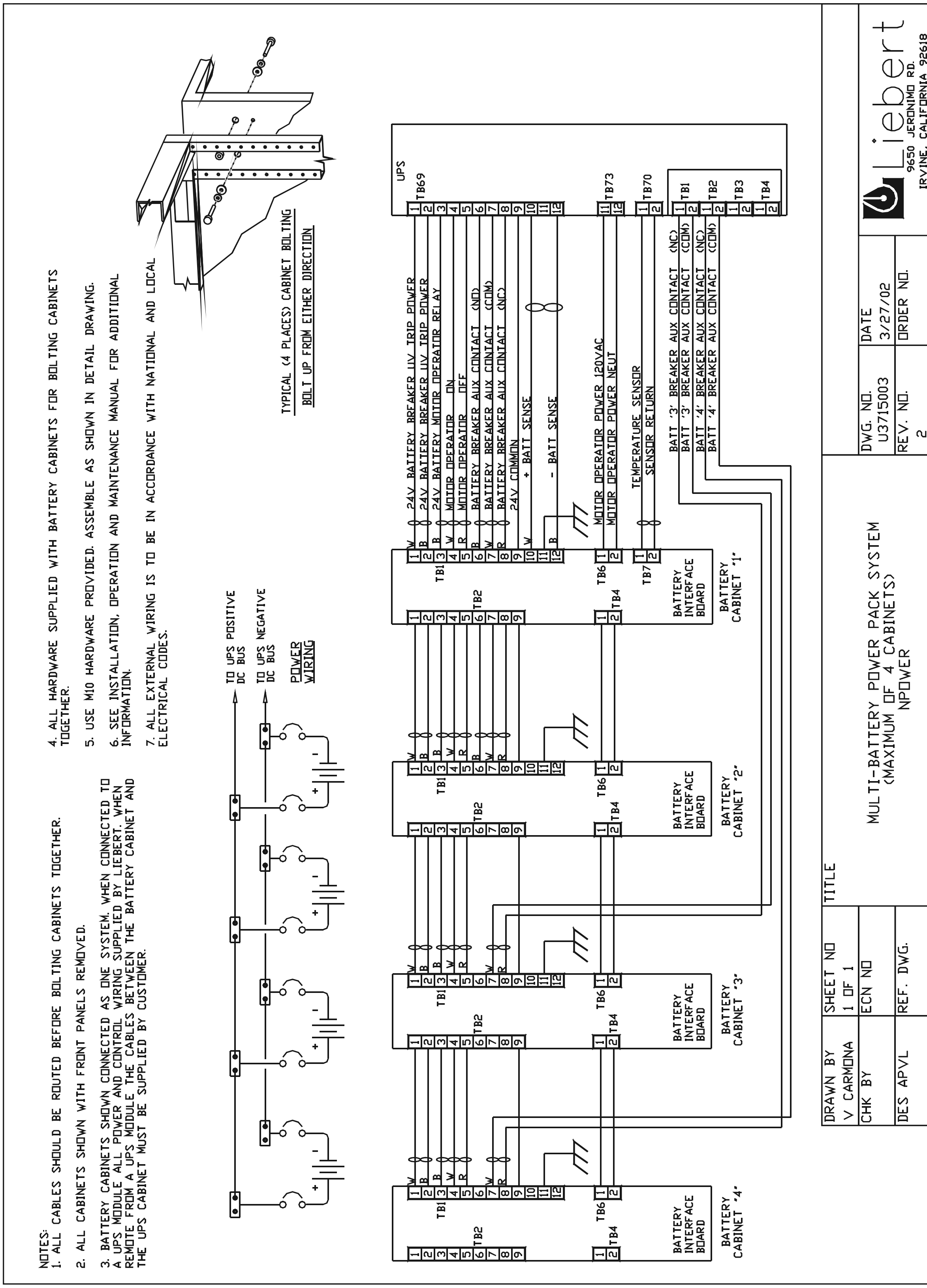


Figure 65 Circuit Breaker Schedule, Maintenance Bypass Cabinet, 30 - 130 kVA

NOTES:

1. ALL BREAKERS ARE SQUARE D.
2. BREAKER PART NUMBERS = PREFIX + 36 + AMPS + AA
3. LETTER "P" IN P/N PREFIX INDICATES LUGS ON LOAD SIDE ONLY.

MBC BREAKER SCHEDULE

kVA/kW	VOLTS	INPUT AMPS	INPUT PREFIX	INPUT AIC	BYPASS AMPS	BYPASS PREFIX	BYPASS AIC	OUTPUT AMPS	OUTPUT PREFIX	OUTPUT AIC
30/24	208	150	NFNM	65k	100	NFNM	65k	100	NFNP	65k
	480	70	NFNM	35k	50	NFNM	35k	50	NFNP	35k
	600	50	NFNM	18k	50	NFNM	18k	50	NFNP	18k
40/32	208	200	NFNM	65k	150	NFNM	65k	150	NFNP	65k
	480	100	NFNM	35k	70	NFNM	35k	70	NFNP	35k
	600	70	NFNM	18k	50	NFNM	18k	50	NFNP	18k
50/40	208	250	NFNM	65k	200	NFNM	65k	200	NFNP	65k
	480	100	NFNM	35k	100	NFNM	35k	100	NFNP	35k
	600	100	NFNM	18k	70	NFNM	18k	70	NFNP	18k
65/52	208	300	NFNM	65k	250	NFNM	65k	250	NFNP	65k
	480	150	NFNM	35k	100	NFNM	35k	100	NFNP	35k
	600	100	NFNM	18k	100	NFNM	18k	100	NFNP	18k
80/64	208	350	NFNM	65k	300	NFNM	65k	300	NJNP	65k
	480	150	NFNM	35k	150	NFNM	35k	150	NFNP	35k
	600	150	NFNM	18k	100	NFNM	18k	100	NFNP	18k
100/80	208	450	NFNM	65k	350	NFNM	65k	350	NJNP	65k
	480	200	NFNM	35k	150	NFNM	35k	150	NFNP	35k
	600	150	NFNM	18k	150	NFNM	18k	150	NFNP	18k
130/104	208	600	NFNM	65k	450	NFNM	65k	450	NJNP	65k
	480	250	NFNM	35k	200	NFNM	35k	200	NFNP	35k
	600	200	NFNM	18k	200	NFNM	18k	200	NFNP	18k

DRAWN BY T CARROLL	SHEET NO 1 OF 1	TITLE CIRCUIT BREAKER SCHEDULE MAINTENANCE BYPASS CABINET 30-130KVA NPOWER	DWG. NO. U3715009	DATE 10/19/00
CHK BY	ECN NO		REV. NO.	
DES APVL	REF. DWG.			

Liebert
9650 JERONIMO RD.
IRVINE, CALIFORNIA 92618

FILE NAME: _Line-UP\U3715009.DWG

Appendix A: Site Planning Data

480 or 208 VAC Input

UPS Rating		AC Voltage		Standard AC Input without Filter			AC Input with Filter Option			AC Output Current			Max.	Max. Heat		Approx.	Concen-trated	
kVA	kW	Input	Output	Nom	Max	Recom-mended OPCD	Nom	Max	Recom-mended OCPD	Nom	Rec. OPCD	Battery KW	Battery Disch. (Amps)	Dissipation BTU/hr Full Load	Dimensions WxDxH (Inches)	Unpacked Weight (Pounds)	Floor Loading (Lb/SqFt)	Cooling Air (CFM)
30	24	208	208	92	114	150	80	99	125	83	125	26	66	8,500	32x32.5x71	2,200	307	720
30	24	480	208	38	48	70	33	41	50	83	125	26	66	7,500	32x32.5x71	2,100	294	720
30	24	480	480	38	48	70	33	41	50	36	50	26	66	7,500	32x32.5x71	1,900	265	720
40	32	208	208	122	153	200	106	133	175	111	150	34	88	11,000	32x32.5x71	2,200	307	720
40	32	480	208	51	64	90	44	55	70	111	150	34	88	10,000	32x32.5x71	2,100	294	720
40	32	480	480	51	64	90	44	55	70	48	60	34	88	10,000	32x32.5x71	1,900	265	720
50	40	208	208	153	191	250	133	166	200	139	175	43	109	14,000	32x32.5x71	2,200	307	720
50	40	480	208	64	80	100	55	69	100	139	175	43	109	12,000	32x32.5x71	2,100	294	720
50	40	480	480	64	80	100	55	69	100	60	80	43	109	12,000	32x32.5x71	1,900	265	720
65	52	208	208	193	242	350	171	213	300	180	225	55	141	18,000	39x32.5x71	2,700	304	960
65	52	480	208	80	99	150	70	88	125	180	225	55	141	15,000	39x32.5x71	2,500	284	960
65	52	480	480	80	99	150	70	88	125	78	100	55	141	15,000	39x32.5x71	2,300	262	960
80	64	208	208	238	298	400	210	262	350	222	300	68	174	22,000	39x32.5x71	2,700	304	960
80	64	480	208	98	122	175	87	108	150	222	300	68	174	18,000	39x32.5x71	2,500	284	960
80	64	480	480	98	122	175	87	108	150	96	125	68	174	18,000	39x32.5x71	2,300	262	960
100	80	208	208	296	370	500	261	326	400	278	350	85	218	26,000	49x32.5x71	3,800	342	1440
100	80	480	208	122	152	225	108	135	175	278	350	85	218	21,000	49x32.5x71	3,600	324	1440
100	80	480	480	122	152	225	108	135	175	120	150	85	218	21,000	49x32.5x71	3,400	305	1440
130	104	208	208	385	481	700	339	420	500	361	450	111	283	33,000	49x32.5x71	3,800	342	1440
130	104	480	208	158	198	300	140	175	225	361	450	111	283	27,000	49x32.5x71	3,600	324	1440
130	104	480	480	158	198	300	140	175	225	156	200	111	283	27,000	49x32.5x71	3,400	305	1440
Notes:			—	1,3,4,5,7,8, 9,11,12, 13						2,3,5,7,8,9,11,12			6,8,9,11,12		14	14	—	—

Notes For Table:

1. Nominal rectifier AC input current (considered continuous) is based on full rated output load. Maximum current includes nominal input current and maximum battery recharge current (considered noncontinuous). Continuous and noncontinuous current limit are defined in NEC 100. Maximum input current is controlled by current limit setting which is adjustable. Values shown are for maximum setting of 125%. Standard factory setting is 115%.
2. Nominal AC output current (considered continuous) is based on full rated output load.
3. OCPD=Overcurrent Protection Device.
4. Feeder protection (by others in external equipment) for rectifier AC input and bypass AC input is recommended to be provided by separate overcurrent protection devices.
5. UPS output load cables must be run in separate conduit from input cables.
6. Power cable from module DC bus to battery should be sized for a total maximum 2.0 volt line drop (measured at the module) at maximum discharge current.
7. Grounding conductors to be sized per NEC 250-122. Neutral conductors to be sized for full capacity for systems with 4-wire loads, 310-15 (b) (4), per NEC, and half capacity for systems with 3-wire loads.
8. Rectifier AC Input: 3-phase, 3-wire, plus ground. AC Output to Load: 3-phase, 3 or 4-wire, plus ground. Bypass AC Input: 3-phase, 3 or 4-wire, plus ground. Module DC Input from Battery: 2-wire, (positive and negative).
9. All wiring is to be in accordance with National and Local Electrical Codes.
10. Minimum access clearance is 3 feet front and 1 foot above UPS.
11. Top or bottom cable entry through removable access plates. Cut plate to suit conduit size. Conduit or wireway must not obstruct removal of top panels.
12. Control wiring and power cables must be run in separate conduits. Control wiring must be stranded tinned conductors.
13. 10% maximum input harmonic current and 0.92-0.95 lagging input power factor at full load with optional input filter.
    30% maximum input harmonic current and 0.85 lagging input power factor at full load without optional input filter.
14. Dimensions and weights shown do not include Battery Cabinet, Slim-Line Distribution Cabinet or other options.

Site Planning Data

600VAC Input

UPS Rating		AC Voltage		Standard AC Input without Filter			AC Input with Filter Option			AC Output Current			Max.	Max. Heat		Approx.	Concen-trated	
kVA	kW	Input	Output	Nom	Max	Recom-mended OPCD	Nom	Max	Recom-mended OCPD	Nom	Recom-mended OCPD	Battery KW	Battery Disch. (Amps)	Dissipation BTU/hr Full Load	Dimensions WxDxH (Inches)	Unpacked Weight (Pounds)	Floor Loading (Lb/SqFt)	Cooling Air (CFM)
30	24	600	208	32	40	50	28	34	50	83	125	26	66A	8,500	31.7x32.5x71	2,200	307	720
30	24	600	600	32	40	50	28	34	50	29	50	26	66A	8,500	31.7x32.5x71	2,200	307	720
40	32	600	208	42	53	60	37	46	60	111	150	34	88A	11,000	31.7x32.5x71	2,200	307	720
40	32	600	600	42	53	60	37	46	60	38	50	34	88A	11,000	31.7x32.5x71	2,200	307	720
50	40	600	208	53	66	70	46	57	70	139	175	43	109A	14,000	31.7x32.5x71	2,100	307	720
50	40	600	600	53	66	70	46	57	70	48	60	43	109A	14,000	31.7x32.5x71	1,900	307	720
65	52	600	208	67	84	100	59	74	100	180	225	55	141A	18,000	39.4x32.5x71	2,200	304	960
65	52	600	600	67	84	100	59	74	100	63	80	55	141A	18,000	39.4x32.5x71	2,100	304	960
80	64	600	208	83	103	125	73	91	125	222	300	68	174A	22,000	39.4x32.5x71	1,900	304	960
80	64	600	600	83	103	125	73	91	125	77	100	68	174A	22,000	39.4x32.5x71	2,700	304	960
100	80	600	208	103	128	175	90	113	150	278	350	85	218A	26,000	49.2x32.5x71	2,500	342	1440
100	80	600	600	103	128	175	90	113	150	96	125	85	218A	26,000	49.2x32.5x71	2,300	342	1440
130	104	600	208	133	167	200	118	147	200	361	450	111	283A	33,000	49.2x32.5x71	2,700	342	1440
130	104	600	600	133	167	200	118	147	200	125	175	111	283A	33,000	49.2x32.5x71	2,500	342	1440
Notes:			—	1,3,4,5,7,8, 9,11,12, 13						2,3,5,7,8,9,11,12			6,8,9,11,12		14	14	—	—

Site Planning Data

220 OR 240 VAC INPUT

UPS Rating		AC Voltage		Standard AC Input without Filter			AC Input with Filter Option			AC Output Current								
kVA	kW	Input	Output	Nom	Max	Recom-mended OPCD	Nom	Max	Recom-mended OCPD	Nom	Rec. OCPD	Battery KW	Max. Battery Disch. (Amps)	Max. Heat Dissipation BTU/hr Full Load	Dimensions WxDxH (Inches)	Approx. Unpacked Weight (Pounds)	Concen-trated Floor Loading (Lb/SqFt)	Cooling Air (CFM)
30	24	220	208	87	108	150	75	94	125	83	125	26	66A	8,500	31.7x32.5x71	2,200	307	720
30	24	220	220	87	108	150	75	94	125	79	100	26	66A	8,500	31.7x32.5x71	2,200	307	720
30	24	240	208	79	99	125	69	86	125	83	125	26	66A	8,500	31.7x32.5x71	2,200	307	720
30	24	240	240	79	99	125	69	86	125	72	100	26	66A	8,500	31.7x32.5x71	2,200	307	720
40	32	220	208	115	144	175	100	125	150	111	150	34	88A	11,000	31.7x32.5x71	2,200	307	720
40	32	220	220	115	144	175	100	125	150	105	150	34	88A	11,000	31.7x32.5x71	2,200	307	720
40	32	240	208	106	132	175	92	115	150	111	150	34	88A	11,000	31.7x32.5x71	2,200	307	720
40	32	240	240	106	132	175	92	115	150	96	125	34	88A	11,000	31.7x32.5x71	2,200	307	720
50	40	220	208	144	180	225	125	157	200	139	175	43	109A	14,000	31.7x32.5x71	2,200	307	720
50	40	220	220	144	180	225	125	157	200	131	175	43	109A	14,000	31.7x32.5x71	2,200	307	720
50	40	240	208	132	165	200	115	144	175	139	175	43	109A	14,000	31.7x32.5x71	2,200	307	960
50	40	240	240	132	165	200	115	144	175	120	150	43	109A	14,000	31.7x32.5x71	2,200	307	960
65	52	220	208	183	229	300	161	202	250	180	225	55	141A	18,000	39.4x32.5x71	2,700	304	960
65	52	220	220	183	229	300	161	202	250	171	225	55	141A	18,000	39.4x32.5x71	2,700	304	960
65	52	240	208	168	210	250	148	185	225	180	225	55	141A	18,000	39.4x32.5x71	2,700	304	960
65	52	240	240	168	210	250	148	185	225	156	200	55	141A	18,000	39.4x32.5x71	2,700	304	960
80	64	220	208	225	281	350	198	248	300	222	300	68	174A	22,000	39.4x32.5x71	2,700	304	960
80	64	220	220	225	281	350	198	248	300	210	300	68	174A	22,000	39.4x32.5x71	2,700	304	960
80	64	240	208	206	258	350	182	227	300	222	300	68	174A	22,000	39.4x32.5x71	2,700	304	960
80	64	240	240	206	258	350	182	227	300	192	250	68	174A	22,000	39.4x32.5x71	2,700	304	960
100	80	220	208	280	350	450	247	308	400	278	350	85	218A	26,000	49.2x32.5x71	3,800	342	1440
100	80	220	220	280	350	450	247	308	400	262	350	85	218A	26,000	49.2x32.5x71	3,800	342	1440
100	80	240	208	256	321	400	226	283	350	278	350	85	218A	26,000	49.2x32.5x71	3,800	342	1440
100	80	240	240	256	321	400	226	283	350	241	300	85	218A	26,000	49.2x32.5x71	3,800	342	1440
130	104	220	208	364	455	600	321	401	500	361	450	111	283A	22,000	49.2x32.5x71	3,800	342	1440
130	104	220	220	364	455	600	321	401	500	341	450	111	283A	22,000	49.2x32.5x71	3,800	342	1440
130	104	240	208	333	417	500	294	368	450	361	450	111	283A	22,000	49.2x32.5x71	3,800	342	1440
130	104	240	240	333	417	500	294	368	450	313	400	111	283A	22,000	49.2x32.5x71	3,800	342	1440
Notes:			—	1,3,4,5,7,8, 9,11,12, 13						2,3,5,7,8,9,11,12			6,8,9,11,12		14	14	—	—

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